THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LVI. No. 1428.] LONDON, SEPTEMBER 23, 1890. [42ND YEAR. Price 6d.

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Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,

Geo. R. HISLOP, Gas Engineer, PAISLEY, N.B.

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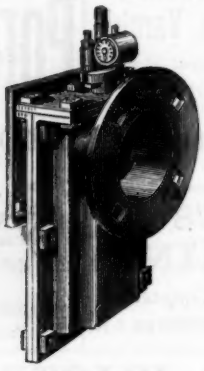

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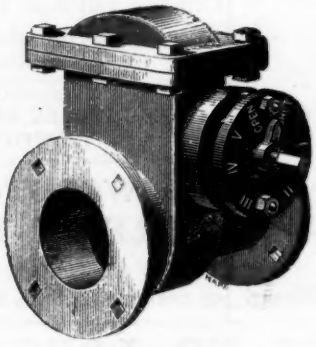

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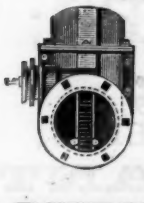

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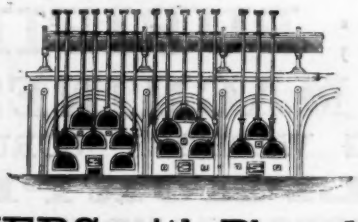

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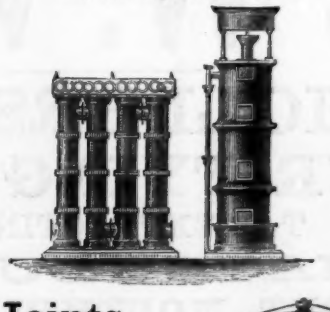

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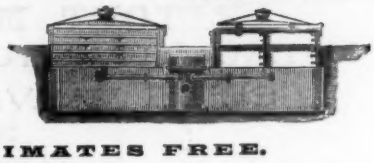

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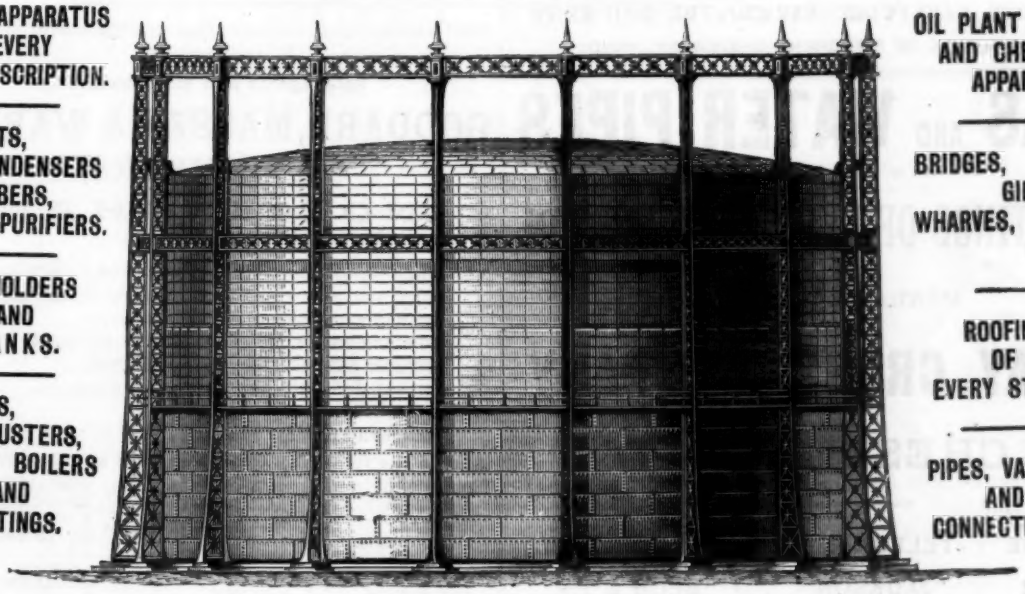

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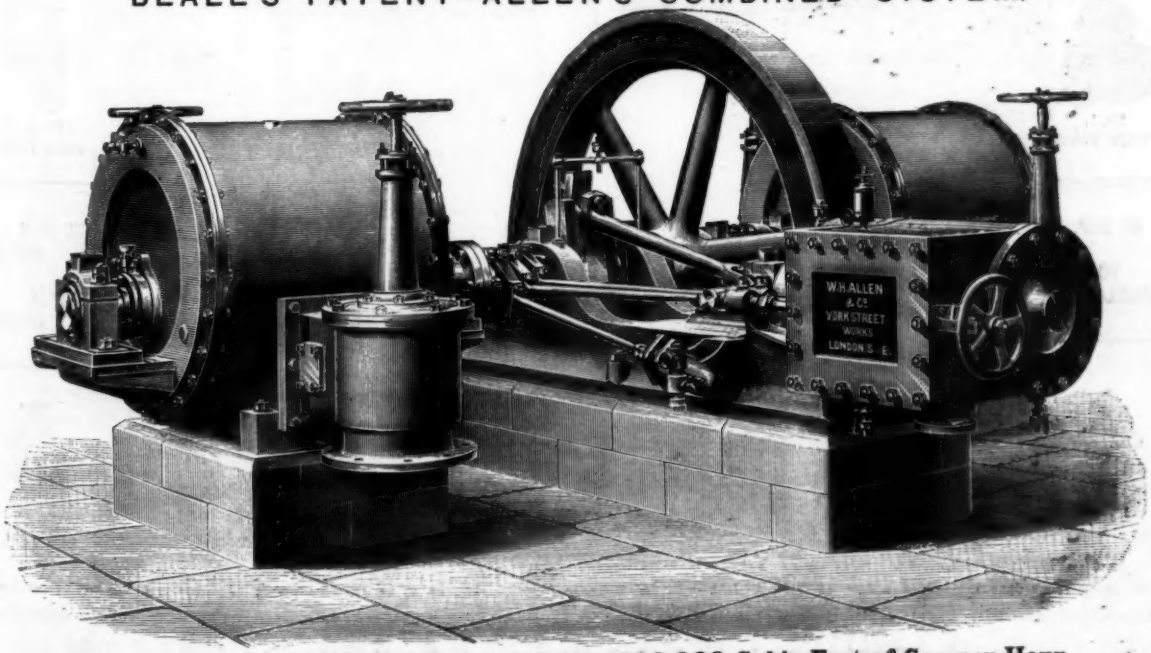

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A STOCK OF DIFFERENT SHAPES ON HAND.

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The most successful and approved Apparatus known up to the present time.

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NO SLIP.

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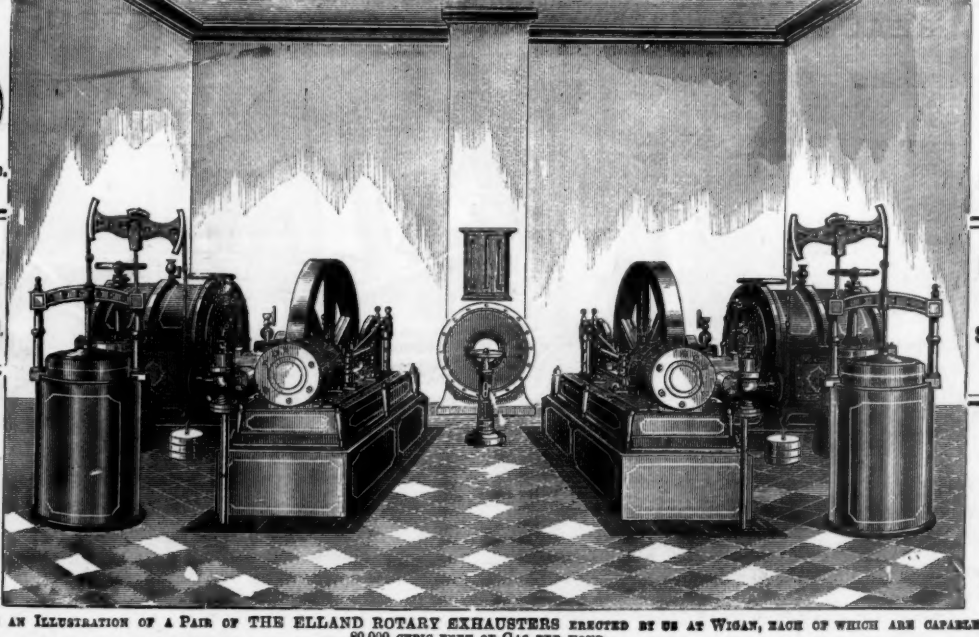

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NO HIGH SPEED.

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HUNDREDS OF SETTINGS WORKING EMINENTLY SATISFACTORY.

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GASHOLDERS, Telescope and Single-Lift, any size. Some of the largest in the Kingdom erected by this Firm are giving the highest satisfaction.

PLANS and SPECIFICATIONS furnished for **Extensions** and **Enlargement** of existing **Works,** adapting them to the most **Improved** and **Modern Principle** of **Gas Manufacture.**

PURIFIERS, CONDENSERS, WASHERS, ENGINES and EXHAUSTERS, STATION METERS and GOVERNORS, manufactured and erected.

Makers, by permission of that eminent authority **Mr. GEORGE LIVESEY,** of his **CELEBRATED PATENT WASHER,** highly approved by all the Engineers of Works where adopted. Largely in demand.

Special reference and attention are invited to our

WET AND DRY METERS,

which have acquired a high reputation for the **excellence** of Materials and Workmanship; their **durability** and **accuracy** of **Register** guaranteed. They are used by several of the **London Gas Companies,** and over **200 Provincial Gas Companies.**

Price Lists, Specifications, and Estimates provided for any work appertaining to Gas Lighting, from the Retort-House to the Drawing-Room.

CHEAP STEAM — FOR — GAS-WORKS.

MASON'S PATENT FURNACE

Can be applied to any kind of Boiler.

It improves the draught.

Economises time in raising steam.

Gives steam quickly at any pressure.

THE

ONLY FUEL

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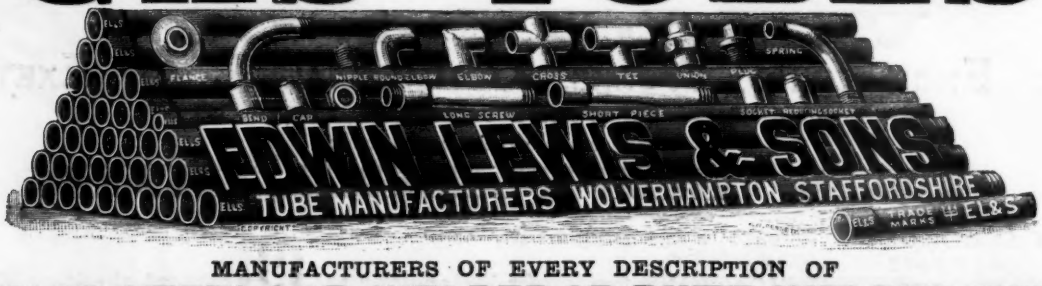

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RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

ESTABLISHED MORE THAN A QUARTER OF A CENTURY.

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MAKE A SPECIALTY OF GASHOLDERS

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RIVER WATER and SEWAGE EFFLUENT successfully and economically treated in large volumes, by AGITATION WITH METALLIC IRON in

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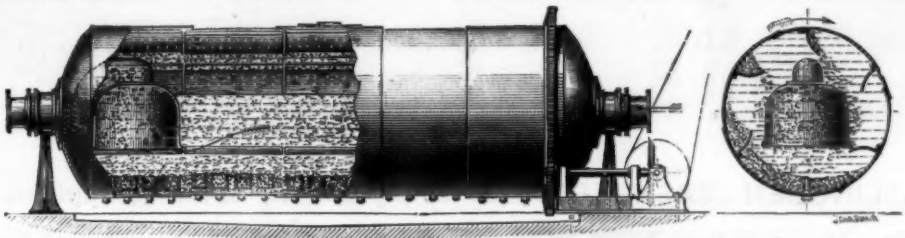

No Choking of Filter-Beds.
Colour due to Peat and Clay entirely Removed.
Simple & Rapid in its Action.
Organic Matter Considerably Reduced.
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Made in Fourteen Sizes, capable of treating singly from **4000** to **1¼** Million Gallons daily.

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DAVIS'S PATENT AMMONIA STILLS, which are the cheapest and most effective in existence.

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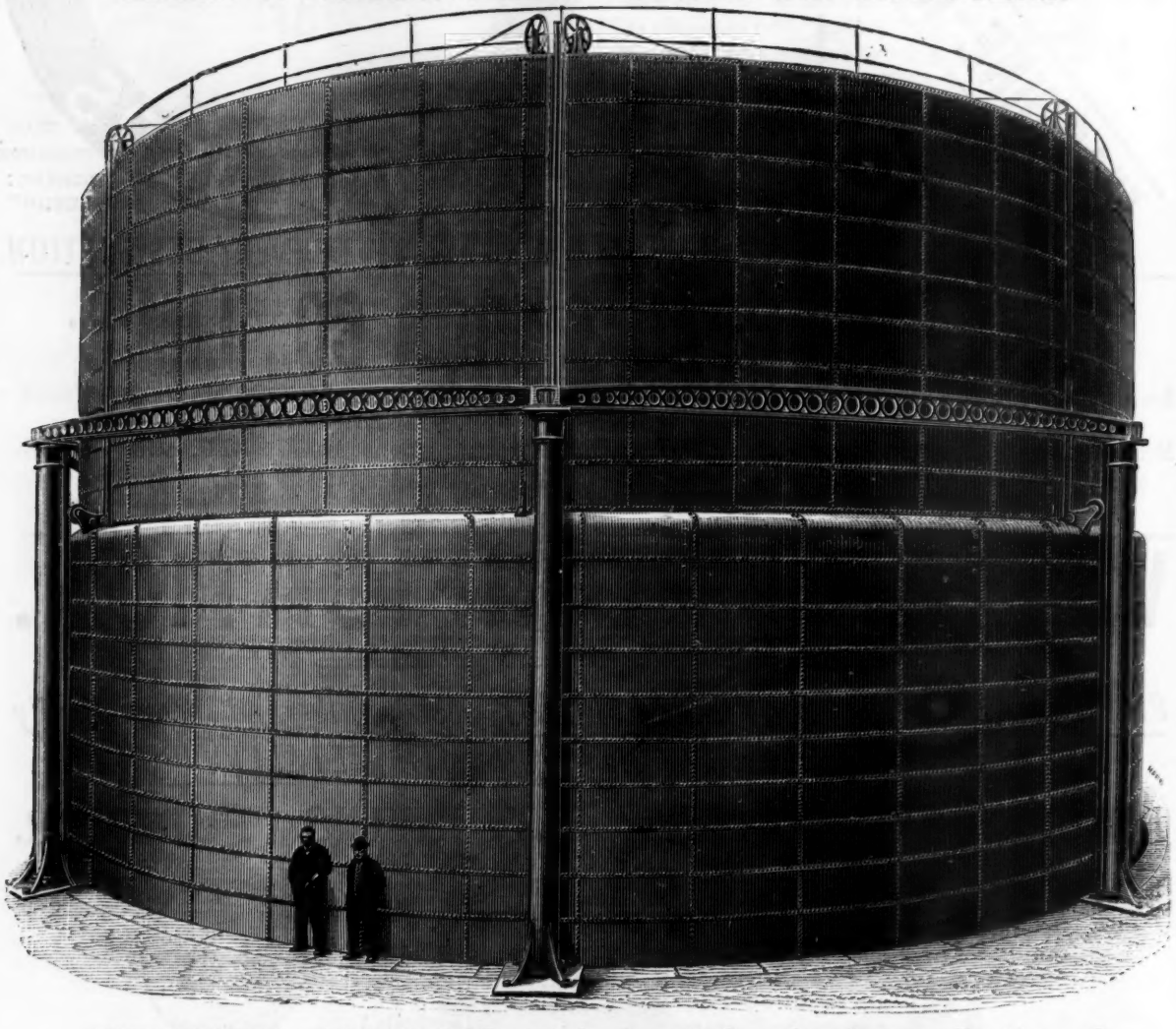

HASLINGDEN GASHOLDER, 80 ft. by 22 ft., showing application of

PEASE'S

PATENT WIRE-ROPE GUIDING.

In adding second and third lifts to present holders, it effects a great saving in cost, and vastly increases the storeage.

The Manchester Corporation have the third lift of a 100 feet holder working by this System.

PEASE'S WIRE ROPES have been also adopted by two other Companies for completely new telescopic holders.

W. & B. COWAN'S DRY METERS.

Outside Dimensions.

Size.	Depth, Back to Front.	Height, including Unions.	Width, including Unions.
Lights.	Inches.	Inches.	Inches.
2	7¼	13¾	10
3	8⅝	15	11¼
5	9½	16¾	13
10	10¾	19	15
20	13¼	24½	18½
30	16½	27½	21¼
50	20¼	33¼	26
60	21	33½	27
80	24¼	40½	31
100	25½	42¼	33¼
150	27¾	50¾	42
200	30	56¾	42¾
250	34¼	58	46¼
300	38¼	63¼	49¼
400	41¾	72¼	56¼
500	46	74	57½

150 Lights and upwards.

Measuring Capacity.

Size.	Bore of Inlet and Outlet.	Per Revolution.	Per Hour.
Lights.	Inches.	Cub. Ft.	Cub. Ft.
2	½	0·083	12
3	⅝	0·125	18
5	¾	0·160	30
10	1	0·3	60
20	1¼	0·5	120
30	1⅝	0·830	180
50	1½	1·428	300
60	1¾	1·6	360
80	2	2·5	480
100	2	2·857	600
150	3	5·0	900
200	3½	6·6	1200
250	3½	7·3	1500
300	4	8·3	1800
400	5	12·0	2400
500	5	14·285	3000

2 to 100 Lights inclusive.

Large Stocks always Ready for Immediate Delivery or for Shipment.

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ESTABLISHED 1827

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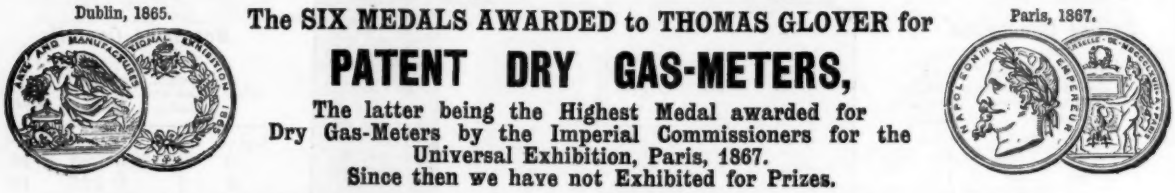
London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.



The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.
Since then we have not Exhibited for Prizes.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

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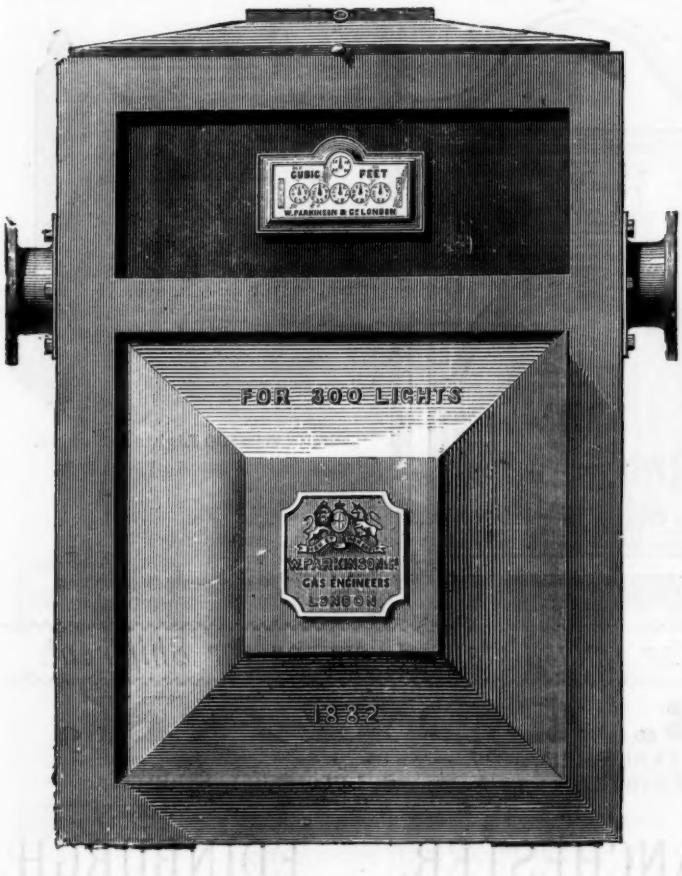
And at 37, BLACKFRIARS STREET, MANCHESTER.

TELEGRAPHIC ADDRESSES: "GOTHIC LONDON," "GOTHIC MANCHESTER." TELEPHONE No. 6725.

1st—Are a remedy for all the defects of Wet Meters.
2nd—Are suitable for all climates, whether hot or cold.
3rd—Incur no loss of Gas by Evaporation.
4th—Cannot become fixed by Frost, however severe.
5th—Are the most accurate and unvarying measurers of Gas.
6th—Prevent jumping or unexpected extinction of the Lights.
7th—May be fixed either above or below the level of the Lights.
8th—Cannot be tampered with without visibly damaging the outer case.
9th—Will last much longer than Wet Meters.
10th—Will not cost more than one-half for repair that Wet or Water Meters do.

Are upheld for five years without charge.

W. PARKINSON & Co.



MANUFACTURERS OF

DRY METERS

OF THE VERY BEST QUALITY.

The DIAPHRAGMS are of the Finest PERSIAN SHEEP SKINS.

The CASES are of the Best CHARCOAL-TINNED PLATES.

WET METERS,

With PATENT THREE-PARTITION DRUMS.

STATION METERS AND GOVERNORS,
PRESSURE & EXHAUST REGISTERS,
MOTIVE POWER METERS,
Test Gasholders, Experimental Apparatus, &c.
PRESSURE GAUGES OF EVERY DESCRIPTION.

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[See also Advt., p. 67f.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 23, 1890.

Labour Topics—The South Metropolitan Strike Pay.

THERE has been nothing very startling to chronicle or comment upon with regard to labour topics during the past week. The Southampton *fiasco* has been settled, after a fashion; and we have had the leaders of the Dockers' Union magniloquently declaring that since that strike was not "authorized," the men who had brought it about "would be punished, not with a severe hand, but one "which was firm and unswerving." This observation probably refers to something to be done by the wirepullers in question to the unfortunate "Bill" Sprow, who was foolish enough to get beaten at Southampton; but as the individual rejoicing in this name has been laid by the heels, with several others, by the myrmidons of a strong, if slow-moving law, they have something else to care for besides the thunders of Messrs. Burns, Tillett, and Co. The party of Labour is engaged in a struggle with the remainder of the community at Sydney; thereby exhibiting the fact that, even in the newest of new worlds, where the working man fancies himself supreme, he is prone to hurry things which do not settle themselves fast enough for him by the ordinary methods of law and industrial adjustments. There is nothing more ludicrous, if regarded in one light, or ominous if looked at in another, than the inconsistency displayed by the puzzle-headed leaders of the Labour Party with respect to laws and statutes. They profess to believe that an Eight Hours' Act, rendering it illegal for anybody to work more than eight hours daily at any trade or occupation, would command universal obedience; whereas they daily and hourly set at naught the common law of the land which upholds the right of all men to pursue a lawful calling in peace and quietness. According to this strange confusion of ideas, assaulting a non-Union man, and preventing him from earning his living, is a meritorious deed; while merely questioning a project of law, at present only talked about, is blasphemy against the sacred name of Trades Unionism.

Mr. Ben Tillett, "orating" upon the subject of the Southampton strike, has admitted that the Dockers' Union is not yet strong enough in men and money to fight the question of Unionism—that is, to insist upon the denial of work to non-Unionists. But in the true melodramatic style which appears to tickle the mob, he bade capitalists beware, for the time would come. We have all heard this sort of rant before, and still wait for the execution of the threat. The truth of the case is that, until our whole social system is upset, and something as yet unimagined put in its place, no Union of workmen will be in a position to assert itself in this way. Even the Unions of skilled tradesmen recognize that their programme requires the free assent of those whom it is intended to benefit. They may and do practise coercion to a degree unsuspected by people who have never had any dealings with them; but the experience of the Sheffield Unions thirty years ago taught them once for all that the employment of violence to enforce their principles was a mistake as well as a crime. We said last week that the turbulence of the mob, now disguised as a Union, was no new thing in English history. Those who, having no other experience, think that there is anything specially novel or portentous about the principles and methods of the so-called New Unionism should read what the late Charles Reade has written in "Put Yourself "in His Place" about the Old Unionism that startled the England of the generation that has hardly yet passed away. It will be matter for surprise if the more timid Broadheads of our time do not go the way of their far more formidable prototype.

It is worth noting that a protest has at length been made against the careless adoption by newspaper writers and others of the term "blackleg" as a means of distinguishing non-Union workmen from the others. An official of a Union has been heavily fined for calling a workman a "scab;" and the other opprobrious term will continue to be employed promiscuously until somebody is made to smart for it. That it is a term of reproach, calculated to bring its subject into odium and contempt, is unquestionable; and why a handful of self-styled leaders of the Labour Party should be permited to fling it about broadcast has to be explained. The danger was that newspaper writers and public speakers should drop into the habit of using the term through sheer carelessness, and for want of a better. In Australia, however, the difficulty has been settled; and the non-Union worker is called a "Freeman." Trench has wisely insisted upon the importance of titles in popular controversies, where so much depends upon what catches the eye and ear of the crowd. Each party in a quarrel endeavours to get itself known by a flattering title, and to fasten some contemptuous term upon its opponents. Thus, in the historical example of the Great Rebellion, if a man called himself a Cavalier and his neighbour a Roundhead, no other exposition of his political affinities was needed. Similarly in this latest rebellion against law, order, and accepted industrial principles, one party has artfully managed to make the honourable general description of "Fair House"

bear the special signification that it is a place where a Trade Union reigns supreme, and which, in some instances, tries to make capital out of the circumstance by claiming the printing, banner making, or other work of the Unions. It is for people who do not desire to have their sympathies captured by a phrase, which, in their more thoughtful moods, they would not accept as appropriate, to see to it that the term "Free House" has equal acceptance with that of "Fair House," and that the Freeman, who refuses to bear the Unionist yoke, is not held up to obloquy by the careless use of a question-begging appellation.

In our "Correspondence" columns to-day, will be found the reply which Mr. Ward (Assistant Secretary of the Gas-Workers' Union) has thought fit to send to our impeachment of the management of the strike pay in the South Metropolitan case, which appeared in these pages three weeks ago. This letter abundantly justifies all that we then stated with regard to Mr. Ward's slipperiness in discussion as constituting ample reason why Mr. Frank Livesey, whom he had attacked and still maligns, should not waste his time by noticing him. Mr. Ward's assertion that "scores of stokers gave over buying the JOURNAL" because of our refusal to permit its space to be further occupied by his long-winded, pointless accusation of Mr. John West, may be classed with the many other flights of imagination that have been evoked from him and his chief by their elevation to an official career. Mr. Ward must permit us to explain to him, however, that the wandering denunciations of an opponent's honesty, sense of fairness, &c., which may serve to amuse open-air meetings of stokers and labourers do not carry any weight with readers of technical newspapers. He imagines he makes a tremendous hit by challenging us to go to his office, and be convinced of the error with regard to the strike pay expended for the South Metropolitan victims. What he fails to comprehend is that nobody who makes a statement in a public organ like the JOURNAL could consent to personally follow the individual respecting whom the statement was made to this or that place for the purpose of being privately instructed in the matter. He wishes us to go to Barking, as he wanted Mr. West to wait upon him in Manchester; perhaps not knowing the while that the request is preposterous. We have made our statement publicly, and put our questions in strict categorical form; and what Mr. Ward has to do is to convince—not us, but our readers, that that statement is incorrect. Abuse of the JOURNAL will not suffice for this. We have proffered him the opportunity of putting the matter straight before the world; and he has not availed himself of it. Whether we are disposed to ridicule him or Mr. Thorne or not is nothing to do with the case. The point that he has to consider is that there are yet a good many people left who regularly read the JOURNAL, even though "scores of stokers" have thrown us over; and that unless he can persuade them that what we have told as the truth of the South Metropolitan strike business is unfounded, they will draw their own conclusions upon the matter. We are not angry, as Mr. Ward evidently is, and have no desire to modify or withdraw in any respect from the position which we took up in the passages referred to by the Assistant Secretary of the Gas-Workers' Union.

The Meeting of the Eastern Counties Association.

THE members of the young Eastern Counties Association of Gas Managers met at Yarmouth last Wednesday, and got through a long programme under the presidency of Mr. John Barton, of Peterborough. The Association was welcomed by several influential gentlemen connected with the gas industry in Yarmouth and its vicinity, including the chief officers of the Yarmouth and the Gorleston and Southtown Gas Companies. The meeting was held in the Town Hall, the use of which for the purpose was granted by the Mayor of the borough, who further manifested his interest in the Association by being present at the dinner which terminated the day's proceedings. Two papers were read, by Mr. James Lees, late of Goole, and by Mr. J. E. Buckle, of Woodbridge, respectively. A marked degree of enthusiasm for the Association was displayed throughout the formal portion of the business. Mr. J. Carter, of Lincoln, was elected President for the coming year, with Mr. Arthur Mead, of Chelmsford, as Vice-President. During the day the members visited two gas-works, and drove to the well-known estate of Somerleyton; so that their time must be considered to have been well filled. It is very pleasant to see a young Society of this kind so well supported as the Eastern Counties Association. It shows that the constituency for whom it was founded thoroughly appreciate the advantages of union in this form, and that the organization is, so to speak, a natural growth of the soil. Sometimes, as has been seen recently, Associations of this order are supported but in a lukewarm spirit by the people they are designed to benefit; and the suspicion is then engendered that they are, after all, exotic plants. The Eastern Association, as the homely saying has it, is "like a young bear, with all "its troubles to come." But its managers have plenty of examples before them of what to follow in the navigation of craft of this class, as well as what to avoid. Add to this the fact that in this district there are no large undertakings, entailing upon their responsible officials cares and studies from which smaller men are exempt, but all the members are engaged in work of the same character, carried on under very similar conditions, and we have in the Eastern Counties something like a typical case, wherein a prudently managed District Gas Association can be expected to flourish. It should be superfluous to remark that all genuine friends of the gas industry must wish continued success to the Eastern Counties Association, which has hitherto progressed so promisingly.

A Gas Consumer's Grievance.

THE fact that almost any communication duly authenticated by the name and address of the writer is welcome to the Sub-editor of a daily newspaper during August and September, must explain the tolerance which admitted lately into the columns of *The Times* two or three perfectly nonsensical letters of complaint from gas consumers who have thought themselves aggrieved by the delivery at their residences of "cutting-off" notices during their holiday absence. A writer signing himself "A Barrister during "the Vacation" began it by narrating a soul-moving tale of how, having had occasion to look in at his house one day while it was shut up, he accidentally found there a final request to pay his gas account, to prevent the necessity of the Company discontinuing the supply. Boiling over with rage because the Company could not perceive that the family was out of town, the gentleman sent his cheque for the amount demanded, with a covering letter asking several stupid questions of the official responsible for sending the notice, which naturally remained unanswered. Therefore he exercised the Englishmen's privilege of grumbling in the columns of *The Times*, which has a specialty in these holiday complaints. This letter brought others; and before the week closed, the discussion wandered from the point, which was originally as to whether Cas Gompanies might be expected to modify their usual procedure for the recovery of debts with reference to holiday seasons, into the inevitable complaint that, notwithstanding reductions of price, somebody's gas bill was no lighter. The first grievance was very fairly dealt with by another correspondent of *The Times*, who showed that ample notice is given by Gas Companies respecting collection of accounts as they fall due; so that if the "Barrister during the "Vacation" was also a Barrister during term time, and stayed in town to attend the Courts until they rose, he would have received in the ordinary way ample warning of what was expected of him before he departed for his holiday. This little explosion shows how inconsiderate some people are in expecting everything to be made to conform, not merely to their reasonable requirements, but also to their neglectfulness and want of forethought. Looked at in one light, it certainly may appear to the consumer sharp practice to threaten to cut off his gas merely because he has gone for a while where official letters cannot reach him; but if he is a reasonable man, he will perceive that a great concern like a Gas Company can only collect its revenues by adhering to a rigid system. The gas consumer, being also a tax and rate payer, would find that the Inland Revenue and parochial authorities would not admit the excuse of his being away for a holiday if he failed to satisfy their demands when they fell due. Harsh as it may seem, we fear the only way to prevent these irritations during holiday time is to exercise the forethought of clearing all bills off before starting. Many people do this, and have their reward not only in a quiet mind, but also in the knowledge that their renewed energy will not be trenched

upon after their return to business by the agitation and labour incidental to inditing furious letters to the newspapers.

An American Peculiarity.

It is a very remarkable fact that the manners and customs of the people of the United States differ in so many ways from those of English people, whose language (with variations) they still continue to speak more or less intelligibly, and with whom they claim like descent, and have so much in common. There are times when we in the old country love to think of all English-speaking folk as essentially one; but we are continually stumbling over perplexing evidences that almost persuade us that in this case the close similarity of the languages spoken on the east and west of the North Atlantic covers many deeply-seated differences of national character, either inherited or acquired. Possibly, when the multitudinous newspaper editors and writers of the States shall have completed their self-appointed task of creating as many differences as possible between the colloquial American and English tongues, the other indications of divergence between the two peoples will be accepted as matters of course. Even now, a considerable degree of practice in the perusal of our American contemporaries is necessary for the understanding of some of their favourite modes of expression. For example, when we meet with a paragraph in a newspaper, dating from somewhere in the oil regions, which curtly states that "Big Squashy came in yesterday at "120," a careful student of Americanese can find a meaning in the words which would be entirely hidden from most readers of English as she is spoken here. This differentiation of the language, however, is, after all, an accident. What puzzles us is the spontaneous peculiarity that is exhibited (say) in the matter of blowing out gas-lights, which, so far as we can gather, is a distinctly American habit that must have arisen in the country, since it cannot have been imported from this side, where it has never existed. Recently, a writer in a newspaper published in Galveston, Texas, asked very pertinently, "Why do people blow out the "gas?" It is a question that has often occurred to us on reading the reported deaths from this cause that occasionally figure in news from the United States towns lighted with water gas. We had thought that it was only dense (and possibly drunken) country people, unaccustomed to gas but familiar with bedroom candles, who practised this trick; but the Texas writer says that over there all sorts of people do it, from "innocents" to newspaper editors. The contemplation arouses in this keen observer some curious reflections upon involuntary actions, hereditary inclinations, and so forth, leading to the conclusion that "this accumulation of custom through so "many ages has resulted now in what is almost an "instinct. It can only be obliterated by a long process "of race education." It is most remarkable that in this case the habit should appear only in the United States. Somehow, this generalization after the manner of Herbert Spencer is not quite convincing; and therefore we should welcome further light on a subject that, in its degree, goes to mark the people of the United States as peculiar.

Waverley Association of Gas Managers.—The fifty-ninth half-yearly meeting of this Association was held at the Station Hotel, St. Boswells, last Thursday week. There was a fair attendance of members and friends. Mr. William Thomson, the Manager of the Duns Gas-Works, presided. The Secretary (Mr. George Taylor) read the minutes of the previous meeting; and they were approved of. After a short address from the Chairman, various subjects connected with gas-works were discussed—viz., gas-cooking stoves, the laying of main pipes and their sizes, the old and new system of heating retort-ovens, the different sizes and shapes of fire-brick retorts, gas-meters, &c. The following gentlemen took part in the discussion: Mr. J. Smith, of Hawick; Mr. W. Robson, of Selkirk; Mr. J. Robb, formerly Gas Manager at Haddington; Mr. Walker, Assistant Manager of Portobello; Mr. W. Blair, of Haddington; Mr. G. Taylor, of Jedburgh; Mr. J. C. Adamson, of the Airdrie Iron-Works; Mr. Hurll, of the Gartliston Fire-Clay Works, Glenboig; Mr. Dobbie, of the Waverley Chemical Works, Leith; Mr. Mackenzie, of Messrs. Alder and Mackay, and Mr. Johnstone, of Messrs. W. and B. Cowan. After the discussion, the members and friends drove over to Dryburgh and spent a very pleasant hour examining the fine old ruins of the abbey. They then returned to dinner, the positions of Chairman and Croupier being ably filled by Mr. W. Thomson, and Mr. W. Robson. The next meeting of the Association is to be held at Haddington on the second Thursday in April of next year.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 663.)

The general tendency of the Stock Markets during last week was in the downward direction. The Jewish holidays caused a falling off in the attendance; and the volume of business was sensibly diminished. The resulting lack of support produced a disposition to droop. Anticipation of a rise in the Bank-rate, too, had its lowering effect. The Directors, however, resolved on Thursday to leave the rate unchanged. The markets, nevertheless, did not recover; it being feared that an increase in the rate will not long be postponed, though this expectation is not universally entertained. The Gas Market has again been quiet, and quite uneventful. Changes in value are few and slight; and with one exception they are in the upward direction—the market generally being very steady. Moderate business has been done on most days in Gaslight "A." The opening price was 239; but this was not attained again, and 238 was about the subsequent average. There is an easier tendency in the secured issues; some of the debenture stock and the 10 per cent. preference, having changed hands at rather low figures, while the 6 per cent. debenture, though not dealt in, has receded 2 in quotation. Business in South Metropolitans has been very limited, and was mostly in the debenture stock, which was in good demand. "A" and "B" have risen 1 each; and the debenture stock, 2. It is noteworthy that, notwithstanding the trials of the last twelvemonth undergone by the Company, its credit in the market stands higher than ever. Nothing was done in Commercial. The Company's accounts will be out this week; and the general meeting will be held on the 3rd prox. The Suburban and Provincial companies have been almost wholly neglected, and present no feature of interest. Of the Foreign undertakings, Bombay is the only one to make a move; the quotation having gone up ¼. Imperial Continental has been fairly active and very steady. Continental Unions hold a strong position; and there have been some dealings in European at figures ranging from 18¾ to 19¼. Monte Video has touched *par*, and looks healthier; but nothing has been noted in Buenos Ayres. The Water companies have been extremely quiet, and all quotations remain unchanged, with promise of steadiness.

The daily operations were: Business was quiet on Monday; and it was almost restricted to the two heavy issues, Gaslight "A" and Imperial Continental. Prices were good, except for Gaslight debentures; the 6 per cents falling 2. Water was a blank. There was more show of activity in Gas on Tuesday; and the same level of prices for the most part was maintained. Some Water debenture stocks were sold at moderate figures. Business was quieter again on Wednesday; but everything was firm. South Metropolitan "A" and "B" advanced 1 each. Water presented no feature. Transactions were brisker on Thursday, especially in the two large issues. Prices were well maintained generally, and Bombay improved ¼. Nothing was done in Water. Business fell off on Friday; but prices were good, especially for South Metropolitan debentures, which advanced 2. West Middlesex Water changed hands at top price. Saturday was quiet, but very firm; and all quotations closed without further variation.

ELECTRIC LIGHTING MEMORANDA.

The Convention of the American Electric Light Association—An American on Municipal Electric Lighting—A Model London Electric Light Station.

The Twelfth Annual Convention of the American National Electric Light Association has been held; and the President, Mr. Marden J. Perry, followed the example of his predecessors in giving his inaugural address something of the character of a census return relative to the electric light industry in the United States. He asserted that there is now a central lighting and power station in operation in every town of any importance in the States. He quoted the number of these stations as 1379, the capital invested as $118,758,500, the number of arc lamps 127,441, the number of incandescent lamps as 1,590,967, and the engine capacity as 356,755-horse power. The combination of grandeur and precision in these figures is truly national and electrical. Even more so was Mr. Perry's assertion that not a single one of these stations has a present capacity sufficient to satisfy one-twelfth of the demand for light and power that exists within the area of its practical working limits. This beats Mr. W. H. Preece hollow. When one is going in for prophecy, there is nothing like doing the thing properly, or as Mr. Perry might say, "running it for all it is worth." One wise remark was made by Mr. Perry, who pointed out that the foundation for the expansion of the electric light interest must be laid in "an unquestionable demonstration that investments in central stations for supplying light and power by the use of electrical currents are safe and profitable." Several other things are also to be established before electricians will, even in Mr. Perry's opinion, be able to enter into their full inheritance; but the first requirement is sufficient for the present. Such being the utterance of the President, it is interesting to observe that not one of the papers read at the Congress attempted to prove that electric lighting as actually carried on in the United States is a safe and paying investment.

Perhaps the most interesting communication read to the

convention just mentioned was a paper by Mr. M. J. Francisco, on the control of electric lighting plants by United States municipalities. The purpose of the paper was to prove that such municipalities ought not to have anything to do with the business in question. The writer declared that the municipal control of electric lighting plants is being advocated by some public men in the States; and, as invariably happens when one American citizen undertakes to criticize the aims and action of the public men of his nation, Mr. Francisco roundly asserts that the desire to make fresh opportunities for corruption and peculation underlies the anxiety of Yankee politicians for the mastery of electric lighting establishments supported out of the public funds. One can never go far in the perusal of a native comment on public enterprises in the United States without coming across the imputation of corrupt motives to somebody. In the case in point, Mr. Francisco has sought out the few examples of municipalities in the States that are trusted with electric lighting plants, and makes them tell a dismal tale of wasted money and bad service. His conclusion from the evidence is that, "No sane or fair-minded man will, with the corruption and fraud practised by politicians at the present day, attempt to prove that it is for the best interest of the taxpayer to place faith in the honest or conservative management of any enterprise which can be manipulated in the political arena for the advancement of the men in power." Apart from this characteristic national outburst against the practical working of those public institutions which Yankees are, on the other hand, never tired of lauding by eulogistic oratory in the abstract, Mr. Francisco has some pertinent things to say against the general proposition that a municipality ought to have the right to sell electricity, or anything else, merely because having the command of the public purse, it could do the work more cheaply than a private firm. As he pertinently argues, there would be no possibility of drawing the line if this doctrine were admitted; but municipalities might undertake cheap printing, brickmaking, baking, and almost every other business at present left to private initiative.

A description, with illustrations, of the central lighting station of the St. James's and Pall Mall Electric Light Company, was recently given in the *Engineer*, from which a fair idea may be formed of the equipment of what has been characterized as a model establishment of the kind. This is what it ought to be, having regard to the situation and opportunities of the Company. If an electric lighting company with a generating station placed between St. James's Square and Jermyn Street, and surrounded by a square mile of such a district for wealth and luxury as could hardly be paralleled in the universe, are not happy, it would be hard to imagine circumstances calculated to make them so. It is reported that the station has been working for 15 months; and is now supplying the equivalent of 5285 lamps of 16-candle power on the low-tension, three-wire system, charging 7d. per unit. The capacity of the present plant is 20,000 lamps. The building containing the plant is 88 feet long by 21 feet broad, and three storeys high; so that a good deal of work is done from a comparatively small centre. Five Davey-Paxman locomotive boilers are fixed. Twelve steam-engines are shown altogether, besides the pumps; all being compound but non-condensing, and working with steam at 150 lbs. initial pressure. The largest distributing main used has a total cross section of 4 square inches of copper; all the mains being laid in well-drained culverts. It is stated that during the last quarter, the consumption of coal at the station was 8·5 lbs. per unit generated, and 9·02 lbs. per unit sold. The cost of working for the same quarter is given as 3·1d. per unit sold; the amount being made up as follows: Coal, 1·01d.; cartage, 0·2d.; water, 0·06d.; stores, 0·15d.; wages, 1·42d.; superintendence, 0·26d.—total, 3·1d. The last item is defined as the cost of looking after the engine-drivers, and does not include the chief engineer's salary. The works staff comprises the chief engineer, two assistants for the works and one for outdoors, five firemen, and four drivers. It is apparent that a great deal has been omitted from this statement of working expenses which must nevertheless appear in the Company's books; and therefore the assertion that the electricity sold only cost 3·1d. per unit is wholly worthless. The Company must recognize that the electricity which they are at present selling at 7d. per unit costs them more; and they can only hope to make their business profitable by increasing it. Nobody would wish to judge harshly the efforts of a young concern to make out the best it can for itself; but it is clear that the St. James's station is as yet largely over-manned, and the Company will have to find out how much trade they can expect in their choice district before they can really know whether their undertaking will prove as profitable.

Presentation to Mr. C. Dakin.—The marriage of Mr. C. Dakin, the Secretary and Manager of the Cradley Heath Gas Company with Miss M. D. Lowe, daughter of Mr. E. Lowe (of the firm of T. and E. Lowe, of Old Hill, Staffordshire), was taken advantage of by the men last Wednesday, to present him with a decanter combination, as a token of their esteem. On the shield was engraved the following inscription: "Presented by the employees of the Cradley Heath Gas Company to Mr. Chas. Dakin, Secretary and Manager, on the occasion of his marriage, Sept. 17, 1890." The same evening the employees were entertained to supper to celebrate the event.

A POINT OF INTEREST TO GAS MANAGERS.

The position and prospects of gas managers is a theme that naturally possesses perpetual interest to actual and prospective members of the class; so that a few words on the subject are always appropriate and timely. It is not our present intention to discuss with any pretence to fulness the conditions of the gas managers' calling as it is pursued at home or abroad, in the Metropolis, or in the provinces. Hardly a Journal appears without some portion of its contents illustrating, directly or indirectly, some circumstance of the gas manager's career. The troubles of his employers, as revealed in our news columns, are generally very largely his troubles; and similarly, though it is to be feared in a smaller degree, their prosperity is reflected in his own. If gas managers were always treated as they think they deserve, they would form a remarkable exception to every other order of the industrial and commercial community. We have always been anxious to use the influence of the Journal for the best advantage of the gas managers who constitute such a numerous class among our readers. The advancement of the gas industry, and the prosperity of all who are identified with it, are twin objects which we never leave out of sight, as reference to our published volumes will testify. It has been recognized and maintained in these pages that the future of the gas industry is bound up with that of gas engineering, as the future of gas engineering is connected inseparably with the prospects of its practisers. Consequently, we have always contended that the representatives of capital who sit as boards of directors, or municipal gas committees, should, for their own sakes, if for no higher motive, preserve a career for the gas engineer by connecting reasonable salaries with all such appointments. The tendency of ignorant and miserly directors and committee-men to entrust important gas undertakings to what such people are fond of calling "practical men," is a standing evil which must be combatted in season and out of season. Over and over again these scandals are perpetrated; and the folly of such appointments is unperceived simply because those responsible for them shut their eyes to every consideration beyond that of "penny wisdom." There are two kinds of motives that induce directors and committee-men to act in this way. The first is meanness, pure and simple. They can get their "practical man," as they call him, cheap at first hand; and the reflection that he may possibly be dear in the end never occurs to them. The other motive is ambition, or meddlesomeness, or something of the sort, on the part of the chairman, or some other high and mighty personage, who prefers as gas manager a slave rather than a competent adviser. More than one chairman of gas directors, and committee of a town council, entertains the conviction that he is a heaven-sent administrator. He hints as much to the awe-struck reporter for the local paper which favours his party; and consequently many a little personal note is put in circulation, exhibiting Mr. Chairman's wonderful tact with the workmen, his business capacity, or some other conspicuous virtue. A big-wig of this stamp does not want a calm and skilful engineer, of equal or perhaps superior education and social standing, to take away any portion of his glory. It is not the salary of a capable engineer that such a magnate objects to; he would gladly pay a good sum for a devoted admirer, whom he could depend on to systematically efface himself. It is because Mr. Chairman will not run the risk of meeting his master that he insists upon managing the undertaking himself, through a foreman, instead of permitting an engineer to take charge, and show what good management means.

It is a grievance of young engineers that the smaller order of gas undertakings, which would afford them a good start in independent experience, are commonly left to foremen stokers or mechanics who work under the supervision of secretaries or directors; all extensions being executed by consulting engineers. The consulting engineer is thus occasionally regarded as the enemy of the gas manager, taking the latter term in its best signification. This is not so, except in a wholly insignificant degree. There are many gas-works, more particularly in the manufacturing districts of the North of England, in which an educated young engineer would be buried alive. Built to supply a group of mills and the population of a mill village, these works may be of considerable coal-carbonizing capacity, and yet afford no scope for any man of higher aims and fuller equipment than a working man born in the locality. In such employment, a locally-bred foreman may be content; whereas a well-brought-up young engineer would eat his heart out. Here then the working foreman and the consulting engineer find a fitting field. It is otherwise, of course, when the gas supply of a good town is left to the tender mercies of a foreman in residence, and a consulting engineer paid by commission on the capital spent by his advice. The awakening from such a course of administration is generally delayed until the death or retirement of the consultant, who is necessarily careful to keep on the "blind side" of his employers; and when it comes the undertaking is usually found weighted with capital obligations that a generation of strict economists can hardly hope to clear off. Even worse is the lot of the gas company or corporation who have not even a consulting engineer to keep them straight, but go on with an unequal team consisting of a headstrong director or alderman and a foreman in charge of the works. Everything is done from hand to mouth in such undertakings. The larger economies are

allowed to slip by unheeded, because unperceived; and the amateur administrators comfort themselves with the thought that, if anything should go very wrong, they can always send to London or somewhere else for an eminent man to put them right. As we have pointed out on a previous occasion, these people never think what would be their fate if everybody else were to do as they do, and neglect to provide for the training of the engineers upon whom dependence must be placed after all in the hour of emergency.

If the gas engineer is yet in too many localities looked upon as a superfluous luxury, as foolish people regard physicians—only to be called in after a long course of domestic quackery has brought the patient to death's door—in some other places he is more fairly treated now than was formerly the rule. It is impossible to shut one's eyes to the fact that the handsome, roomy engineering structures which are to be found in most of our prosperous gas-works of to-day, where they utterly dwarf the poor and dirty memorials of a bygone age, symbolize a corresponding advance in the circumstances of the engineer. In a well-administered gas-works supplying a self-respecting town, the leading stokers are as well off now as the man who was called the manager was in a by no means remote past. This is, of course, where the owners of the undertaking understand what is due to themselves and their property, and realize that stability, order, progress, and appropriateness can only be exhibited where the master possesses the character and accomplishments which in action have these expressions. Fortunately, these examples are not few and far between in our land, which is still the school (as it was the cradle) of gas engineering.

Among other evidences of the changed conditions of the gas manager's calling at its best, may be cited the comparatively modern abandonment of the mediæval tradition that the manager ought to live upon the works. It is happily seen that the towns where the manager is condemned to live in, or immediately adjoining, his works are becoming fewer every year; and we desire to take this opportunity for advocating the rapid extension of the movement. Whatever may have been the case when the manager, except in very large works, was his own foreman, and when the arrangements of the plant, being of a more rudimentary description than is usual now, could not be depended upon for many hours together, there is at the present time no real necessity for insisting upon the manager working 24 hours per day, and being helped by his wife and family—which is what living in the works amounts to. When the manager's house is in the works, he is never off duty. Discipline among the men and self-reliance on the part of the foreman and leading hands can never be perfect while there is the possibility of instant appeal by day or night to the manager. A manager who is always in and about the works has his men in leading strings, which worry him and them, yet which he dare not relax for a moment. Every little hitch and worry which the foremen could and would bear if the manager were out of the way, falls upon him; while perchance he is sufficiently strained by more important cares. It is the mosquito-bites that worry a man to death; and from these the manager who lives in the works is never free. The difference between the circumstances of such a man, and those of the manager who can lock up his office when office-hours are over, and turn his back upon it all until the morning, requires to be experienced to be properly realized. In short, the custom that still obtains in certain towns, of requiring the manager to live in or adjacent to the gas-works, is a survival from another age, when all the conditions of the calling were different.

It would be impossible, of course, to draw a hard-and-fast line in a matter of this kind; and all we contend for is the general recognition of the principle that gas managers should be delivered from their traditional watch of 24 hours a day. We could name gas-works in the kingdom where the manager's residence, although technically upon the works, is practically separated from them, and is really pleasantly situated. In other places the poor manager and his family have to live in a dingy, damp, unhealthy, and lonely hole, where his only visitor is the doctor, and his neighbours are specimens of the lowest orders of the community. Where this latter state of things is merely the result of superstition, it is high time a change should be made. Nobody would pretend that the manager of a gas-works should be inaccessible after office-hours; but we mean to say that the advantages of having him constantly on the spot are grotesquely exaggerated. If he cannot so design and regulate his works that they will go for a night without him, he is unworthy of his position; and in times of emergency he would be equally unworthy his trust if he could not sacrifice his comfort so far as to spend as much time at the works as might be required. Under ordinary conditions, however, an educated and respectable man in the position of a gas manager ought to be permitted to live and bring up his family amid suitable and healthy surroundings; and if these do not exist in regard to his traditional official quarters, he should be encouraged to select others. If there are gas directors and committeemen anywhere who have not taken these considerations to heart, we trust these words of ours will arouse them to a sense of their duty. In default of this reminder proving effectual, it is to be hoped that every gas manager cursed with a lonesome, unhealthy dwelling-house on his works will lose no time in discovering that the site is imperatively needed for some urgent extension of plant. A little of the wisdom of the serpent is not amiss when selfishness or stupidity in high places has to be circumvented.

NOTES.

The Internal Oxidation of Cast-Iron Mains.

According to a correspondent of *Engineering*, Herr Oesten the Chief Engineer of the Berlin Water-Works, has formed a simple theory to account for the appearance in cast-iron water-mains, of the nodular oxidation of the metal, which is so troublesome to water-works engineers. Herr Oesten remarks that these knotty places inside water-mains are formed in layers. In every case the outside layer is the hardest and strongest one, while those towards the inside are much softer; and the interior of the nodule is generally filled with a pasty mass. He explains that when the inside skin of the pipe takes up oxygen from the water, it swells and forms itself into buckles or creases in the endeavour to find room for itself. The outside is the most highly oxidized, as being in contact with the source of oxygen; but it has behind it layers not so fully charged with oxygen, which in their turn feed upon it, so that the oxidation gradually progresses from the outside to the inside of these nodular accretions. In this way, the outside of the corroded parts is compelled to remain at a lower grade of oxidation than the inside; and so it happens that when a corroded piece of pipe is freshly cut out, the rust on it is always blackish on the surface, and never has the red-brown colour of full oxidation which it attains on exposure to the atmosphere, whereby the process of oxidation is completed. In proof of this theory, Herr Oesten observes that if the rusty iron corrosion, in the condition of mud, from the inside of a pipe is placed while fresh into an air-tight bottle, it adheres to the inside surface without changing colour. If air is then admitted, the deposit will redden on the surface; the colour disappearing again if the bottle is closed—showing that the oxidation has retrograded. In Herr Oesten's opinion coating the inside of water-pipes only delays but does not prevent the oxidation, which has to be emoved from time to time by scraping.

Wrought-Iron and Steel *versus* Cast-Iron Mains.

In discussing the general question of the best material for underground mains, the American Water-Works Association, at a recent meeting, debated the point as to whether the superior advantages of steel as the material for mains under pressure are not counterbalanced by the passive resistance to destructive oxidation of the heavy cast-iron mains in common use. The New England Water-Works Association have for years debated the same question; cement pipe being contrasted with cast iron for low pressures. Upon this subject Mr. James C. Bayles writes to the *Engineering Record* to predict that the days of the cast-iron main are drawing to an end. He declares that this construction represents too much dead weight for too little strength; and says that "wise engineers long ago reached the conclusion that the most costly and least satisfactory way of protecting iron against oxidation is with mere bulk of its own substance." Mr. Hamilton Smith, junior, contributed to the Iron and Steel Institute in 1886 a paper on light wrought-iron and steel pipes, which left little room for future discussion. Experience, at least in the United States, shows that the practicable limit of size for cast-iron mains is 48 inches, even when the pressure is low. It is evident that wrought-iron or steel mains may be of any size, which is an important consideration when the supply of a large city is in question. The problem of the protection of steel tubes in the ground is no longer a cause of anxiety to the engineer. A steel tube $\frac{1}{16}$ inch thick, properly asphalted, will under normal conditions have a longer life in the ground than a cast-iron pipe $\frac{1}{4}$ inch thick. Meanwhile it will be impervious, which cast-iron is not. Experience in New York with cast-iron gas and water pipes shows that they long outlive their real usefulness as conduits.

The Utilization of Fire Damp.

According to a report originally appearing in the *Zeitschrift für des Berg-Hütten*, &c., and abstracted for the Proceedings of the Institution of Civil Engineers, the most elaborate attempt ever made in Europe to obtain from a coal seam a natural combustible gas that should be capable of being used like the natural gas of the American oil region, ended in a conspicuous failure. The mine was situated at Erenenberg, near Aachen; and plenty of gas was apparently forthcoming when it was not wanted. Its systematic removal from the workings, for utilization above ground, was effected by an exhauster connected by a main and branch feeders with every part of the mine. The smallest feeders were 1-inch pipes, which terminated in suction roses perforated on the top side only, which were kept at the top of the levels by means of clamps attached to the timbering. The exhausted gas, which was necessarily a mixture of gases and air, was delivered into a double holder, so arranged that one-half was constantly being filled while the other was emptying. After a time, as this arrangement did not work satisfactorily, the holders were abandoned, and the gas forced by the exhauster directly into the delivery-pipe. The ultimate failure and abandonment of the experiment was due to the irregularity of the gas production in the mine, the air from which sometimes contained as much as 10 per cent. of fire-damp, and sometimes none at all—the variations occurring without any apparent cause, and rendering it impossible to work the exhauster with any reference to the production. The underground collecting arrangements also gave a great deal of trouble, and hindered the work in the headings. The gas,

when it could be burnt, was applied to the firing of two boilers; a row of jets being introduced below the firebars from a tube connected with the main, and protected by a water seal. At all the joints of the gas-pipes wire gauze diaphragms, similar to those used in safety lamps, were inserted. The gas did not effect any economy with the boilers. It was also tried as an illuminant with the help of the Fahnejelm magnesia comb; but only the lower third of the rods could be brought to the proper degree of incandescence. The third suggested application of the gas, for driving gas-engines, was not tried, for reasons which can be easily divined.

An Extraordinary Sight.—Early in the morning of the 11th ult., the farmers near Waldron which is eight miles south-east of Shelbyville, Ind., were startled, says the *Scientific American*, by a terrific explosion. When they reached the Ogden graveyard, which is on a bluff near the Flat Rock Stream, they discovered that fully ten acres of the earth were in commotion. Geysers were shooting up to the height of 6 feet and 8 feet, and gas was blazing from 10 feet to 15 feet above the waters of the geysers. The river bed was torn up, and the water had stopped running below the graveyard. The last information received by our contemporary was that flames were still shooting from fifty different fissures in the earth.

"The Labour Movement in America."—In a small octavo volume of about 400 pages, recently issued by Mr. W. Heinemann, of 21, Bedford Street, W.C., Mr. Richard T. Ely, Ph.D., Associate in Political Economy at the Johns Hopkins University, deals with the large subject comprised in the above title. He opens, as might be expected, with a general survey of the field before him, and then gives a sketch of American Communism. Labour organizations are next dealt with; being considered from their economic, educational, and general standpoints. After a chapter devoted to the subject of co-operation in America, the great question of Socialism is approached. The socialistic labour party is described, and its objects reviewed. The strength and significance of revolutionary Socialism are discussed; and then the author sets forth the remedies he proposes for existing troubles. They are as follows: Labour Organization, the School, the State, and the Church. These are the four chief agencies through which, according to Dr. Ely, we must work for the amelioration not only of labouring people, but of all classes of society. The labour question is not one which it is usually the province of a technical publication to discuss, though it has lately, owing to force of circumstances, occupied a prominent place in the contents of the JOURNAL. In the case of gas-works employees, a notable attempt was made to increase their interest in their work and improve their position by giving them a share in the profits of the undertaking in which they were engaged. That proposal was rejected with scorn and contempt, and its originator loaded with abuse. Whether or not the result would have been different if the influence of "the School, the State, and the Church" had prevailed over that of mob oratory, we will not stop to inquire. It is impossible to discuss the contents of Dr. Ely's book in this short notice of it; but we can given an extract from his "Final Word" to working men. It is this: "Beware of demagoguery, especially political partyism, which will give illusory triumphs, but leave to you only wretched failure."

The Water Supply of Palermo.—The sources of the water supply of Palermo and the methods by which the water is distributed are described in the last report of the British Consul there. The deficiency of supply, especially in summer, has long been one of the great grievances of the householders in Palermo. The supply at present is meted out in *penne*—that is "quills"—of water; a *penna* being a continuous supply of as much water as will run through a pipe the size of a goosequill. There are houses of three storeys in Palermo, inhabited by three or four families, which have no more than a supply of one *penna* of water per diem, and even this at times is intermittent; for the men who have the care of the water-pipes contrive, when water is required for irrigating orange and lemon trees and melons, to divert for a consideration the course of the water from its proper destination. The running water with which Palermo is mainly supplied comes from sources in the hills near Monreale. The system by which the distribution is effected is very curious, and is said to have come down from the days of the Arabs. Visitors making excursions in the environs have often been puzzled by the appearance along the roads from time to time of strange structures in the form of lofty truncated obelisks. These are called water-towers, and some of them are very ancient, built of stone, and overgrown with ivy. There is usually an iron ladder reaching half way down, by which the watermen, or turncocks (who carry portable ladders to join thereto), can get to the summits. On the top of each tower is a small reservoir, into which the water rises from the pressure caused by its descent from the mountain; and from the reservoir the liquid is distributed in pipes to the neighbourhood. The explanation of the use of these towers is not very clear; but engineers say they act as a check on the rush of water in the earthenware conduits, and prevent them from bursting. The inhabitants of Palermo have long had cause to complain of the scanty supply of water. The news, therefore, of the formation of an Anglo-Palermian Company for bringing a supply from a copious source at Scillato, some 20 miles off, has been greeted with much satisfaction.

COMMUNICATED ARTICLES.

THE VALUATION OF GAS-WORKS FOR ASSESSMENT.

By Thomas Newbigging, M. Inst. C.E.

V.

Repairs and Maintenance.—It is argued that these are the landlord's concern (the words of the Statute being quoted in support of this view), and for that reason should not be included under the head of expenditure, but classed with the Statutory Deductions. Dealing, however, with the matter in a practical way, it is fairer to class them as we have done in the present example.

The actual renewal or reproduction of the buildings, apparatus, plant, and mains is a duty devolving on the landlord; but ordinary and current repairs and maintenance must necessarily be undertaken by the tenant. This is a necessity of the situation. When a bed of retorts needs renewing, or a worn-out service-pipe replacing, or a split main substituting by a sound one, or the slating of a roof, which has been removed by the wind, reinstating, it is absurd to suppose that the tenant will hunt up the landlord to do what is required to be done. He does it himself, dipping into his funds to defray the cost. The proper place for these charges is, therefore, under the head of the expenditure for the year. Authorities are not lacking in support of this view. Treating on the question in regard to railways, Mr. Balfour Browne remarks: "There is a difference of opinion between appellants and respondents, not so much as to whether it should or should not be allowed as a deduction from gross receipts, for that seems to be conceded by the parishes, but as to the propriety of placing it amongst working expenses; the surveyors who advise the parishes contending that it should be regarded as a statutable deduction, and that a sum should be allowed in that place which will cover both the repairs and maintenance of the ways and works and the renewals. . . . . In one aspect this contention seems justified. The amount expended on maintenance may fairly be regarded as a portion of that sum which is disbursed with a view to keeping the hereditament in a condition to command the rent; while that which is laid aside to meet ultimate renewals is in the nature of an insurance. . . . Still, it makes really no difference in the end, although possibly the arrangement proposed by the parishes may be logically more correct." * On the same subject, Mr. E. J. Castle says: "The repairs may either be considered as done by the tenant or the landlord. In either case they are to be deducted—though the words of the Parochial Assessment Act seems to treat them as being done by the landlord. The tenant is also entitled to his profits, which are generally taken as being a percentage on his capital necessarily invested in the occupation. These deductions, when made, give the gross yearly rental value of the property—that is to say, the rent the tenant can afford to pay. From this have to be deducted the probable annual average cost of the repairs, if not previously estimated as a tenant's expense, insurance, and other expenses, if any, necessary to maintain the property in a state to command the rent." † Again, Mr. G. B. Rosher remarks, "The ordinary repairs done to the railway *are invariably placed under the head of working expenses*, though it really is a landlord's deduction. But, over and above the item of maintenance of way, the landlord is entitled to an allowance under the head of renewal of way. For just as an allowance is made to the tenant for depreciation of rolling stock in addition to an allowance for its annual repair, so must an allowance be made to the landlord to countervail the gradual depreciation of the way, and the consequent necessity for its renewal from time to time, if it is to continue to command the rent. The allowance is to be not of the actual expenditure in the year when the renewal is effected, but of the annual expenditure on the average." ‡

The necessary and ordinary, and constantly recurring repairs, like all other charges (excepting those relating to capital), have to be met out of revenue. But, in the meantime, till the receipts from the gas consumption begin to accrue, the tenant provides the money for executing them; and therefore it is but reasonable that he should have his proportionate allowance by way of working capital for that portion of his expenditure for the year.

The cost of repairs or maintenance, and renewals, necessarily varies considerably in different years. Six to ten years ago it amounted to 7d. or 8d. per 1000 cubic feet of gas sold. Of recent years the average would be about 5d. or 6d.; but with the increased cost of material of all kinds and labour, it will probably again reach, or exceed, the higher figure. In order, therefore, to equalize the expenditure under this head, instead of taking the actual figures of the year, it is usual and more satisfactory to fix the outlay per 1000 cubic feet of gas sold at a rate deduced from the average expenditure of a number of years. In the present example, I have taken the cost of the repairs and maintenance at 4½d. per 1000 cubic feet. It will be seen that the

* "The Law of Rating." By J. H. Balfour Browne, Barrister-at-Law. London: Stevens and Haynes; 1875. (See p. 192).

† "A Practical Treatise on the Law of Rating." By Edward James Castle, Barrister-at-Law. London: Stevens and Sons; 1879. (See p. 474).

‡ "A Treatise on the Principles of Rating." By George B. Rosher, B.A., Barrister-at-Law. London: W. Maxwell and Son; 1883. (See p. 150.)

amount allowed for renewals, under the head of statutable deductions, works out to 3d. per 1000 cubic feet, and the two added together give 7½d. per 1000 cubic feet as the total cost of repairs and renewals—a figure which, on an average of years, and taking the expenditure of the principal gas-works throughout the country, will be found in these times of dear materials and high wages to be fairly within the mark.

Rates and Taxes.—These consist of the poor's rate and the other local rates, but do not include income-tax, which is a purely personal expense not incidental to carrying on the business, and therefore not included in the expenditure to find the net receipts. They are reckoned at the rate in the pound according to the amount of the local rating, in this instance 5s. on the ascertained rateable value.

Miscellaneous and Law Expenses.—It is not permissible to charge the whole costs (if these have been heavy) of any lawsuit that may have been incurred during the year under consideration. A reasonable average sum for law expenses must be taken.

Having obtained the net receipts by subtracting the expenditure from the gross receipts, we have now to determine how much of these net receipts belong to the landlord, and how much to the tenant. With this object in view, it is necessary to fix the amount of capital which the tenant would require to provide in order to carry on the concern. This we shall now discuss; premising that it is usually the most contentious portion of a valuation of this kind.

Tenant's Capital.

Working Expenses.—When the gas accounts are collected quarterly, the proper allowance for working expenses is five-twelfths of the year's expenditure; because an interval of five months elapses before the revenue comes in to reimburse the tenant for the outlay he has incurred. If the accounts are collected at longer or shorter intervals than three months, the claim under this head is increased or reduced as the case may be.

Stock of Coal.—It is yearly becoming more evident, in view of the recurring labour disputes, that a six weeks' stock of coal, calculated on the maximum daily consumption in mid-winter, is a reasonable stock to provide, to ensure that the manufacture of the gas, so far as the raw materials is concerned, may be carried on economically and with certainty. We have heard it asserted by official valuers for Assessment Committees that the charge for coal in stock should not be entertained, because it is already provided for in the five-twelfths of the expenditure for the year. This argument is a fallacy on the face of it; the stock is not so included. The five months' allowance for coal has all been used up, and the surplus stock also provided before the revenue from the gas consumption is collected.

Sundry Stores.—This item includes miscellaneous stores of all kinds, such as retorts, bricks, tiles, fire-clay, a limited supply of pipes and thimbles for current repairs of mains and services, lead, spun yarn, lime, oxide of iron, &c. The tenant would also have to take the stock of coke, tar, ammoniacal liquor, and spent lime at the beginning of his tenancy; and it is proper, therefore, to include these to the extent of one-fourth of their value in the amount under this head.

Tools and Implements, &c.—This embraces stokers' tools, wheel-barrows, picks, shovels, hammers, chisels, and other miscellaneous tools and implements, with carts and horses, if any.

(To be continued.)

Mr. Solomon Longworth, of Whalley, near Blackburn, it is stated, has been appointed Chairman of the Accrington Gas and Water Company, in place of the late Mr. Swain Rhodes; and Mr. Alderman Haywood, of Accrington, has been appointed Vice-Chairman.

American Gaslight Association.—According to the preliminary announcement which has been issued by the Honorary Secretary (Mr. C. J. R. Humphreys), the eighteenth annual meeting of the American Gaslight Association will be held this year, on the 15th prox. and two following days, under the presidency of Mr. M'Millin, at Savannah. This is a very pretty city; and being the first time that the annual convention has been held so far south, it is hoped that it will be one of the most successful ever experienced. Some of the papers required have already been promised; and, judging from their titles, they should evoke good practical discussions. "The Extension of the Use of Gas for Purposes other than Illumination," will be dealt with by Mr. E. G. Pratt, of Des Moines, Ia.; and Mr. E. G. Cowdery, of Milwaukee, Wis., will have something to say on "The Management of Gas-Works." Mr. H. C. Adams, of Philadelphia, has chosen for the subject of a paper, "Gas Coals of the United States;" and Mr. A. G. Glasgow, of the same city, will speak of "The Efficiency of an Illuminating Water-Gas Setting." The programme on this occasion would not be complete without a discussion on inclined retorts; and a contribution thereon is expected from Mr. Frederic Egner, of St. Louis, Mo. On the evening of the second day, the Savannah Gas Company will entertain the members at a banquet; and efforts are being made to have a river excursion on the last day of the meeting.

THE USE OF COAL GAS FOR HEATING, COOKING, AND TRADE PURPOSES.

By A Gas Inspector.

The importance which is now, on all hands, being attached to the question of the use of coal gas for heating, cooking, and industrial purposes, and the future that lies before this department of the gas industry will, I think, be sufficient justification for bringing before the readers of the JOURNAL the following thoughts, based as they are upon an experience resulting from some years' work amidst all classes of gas consumers. Constant communications with the intelligent and business classes of the gas-consuming public upon matters relating to gas supply are interesting and helpful; and if they are made the subject of careful consideration, they may become the means of establishing happy and healthful relations between the producer and the consumer.

In an article contributed to the JOURNAL some months ago,* I brought under notice certain suggestions which, originating in conversations with the customers of the gas company with which I am connected, wherein their ideas and requirements have been fully laid before us, have commended themselves to our minds; and their adoption has usually been very successful—the existing relations with the consumers being improved, and consequently the commercial basis of the undertaking more firmly established. The suggestions thus put forward—bearing chiefly upon the facilities which might be offered for the furtherance of the use of coal gas in every direction—deal, from a consumer's point of view, with such matters as money securities, short-period contracts, security or guarantee contracts, &c.

As the preliminary step to the use of gas for cooking, heating, &c., is, of course, the introduction of a supply, I must briefly touch upon the means that have been suggested for removing the obstacles so generally presented to the prospective consumer before his service can be laid on. Doubtless the chief of these difficulties is the deposit which, as a rule, is at the very outset demanded of him. I do not share the confidence of many with regard to the assistance supposed to be derived from the deposit in the due collection of the accounts; and for reasons which have already been fully set forth in the columns of the JOURNAL, I am assured that in many cases—probably by far the majority—this deposit may, with great advantage, be entirely dispensed with. I do not, however, recommend the granting of supplies indiscriminately. There are means other than money securities by which the due payment of the accounts may be assured, and which, if perhaps not quite so reliable, are so much better adapted to the consumers' requirements and convenience, that, by popularizing the use of the gas, they would more than compensate for any isolated cases of loss arising from the departure from the old system.

The substitutes for money securities include the establishment of a system of reference between the various gas undertakings, whereby the antecedents of an applicant for a supply of gas might be ascertained prior to the preparation of a contract; also the system of guaranteeing payment on the part of some well-known consumers; and, further, in order to meet as far as possible the convenience of the consumer, the granting of short-period contracts. The numerous advantages of monthly and weekly contracts have been well brought to the front of late, and have been fully discussed at meetings of The Gas Institute and similar gatherings. Suffice it to point out here that their desirability is greatly emphasized by the experience of the public as regards the easy terms upon which illuminating oils can be supplied, and which have of late tended to advance the oil trade so materially. I would further refer also to the matter of the charges to be made for laying on a supply of gas. These should be as light as possible; and, if the finances would allow, should be foregone altogether—provided, of course, that some undertaking is given either to take a supply for a definite period, or, in default, to pay a certain proportion of the cost incurred.

In this paper, however, I am more particularly concerned with the course to be taken and the arrangements to be made with regard to the extension of the business of gas supply in the heating and cooking department—a supply for illuminating purposes being already laid on. This subject is an interesting as well as important one; and I will deal with it under three heads—viz., advertising, educating the consumer, and affording facilities for the fitting-up of gas appliances.

In connection with the first point—advertising—there has lately been considerable improvement. Still, much remains to be done. To judge from the enormous outlay incurred in this department of trade alone by certain well-known caterers for the comfort and health of the public, there must be something substantial to be made out of judicious advertising. Certainly, the managers of gas undertakings have not erred as yet on the side of liberality in this respect. One of the best means of advertising is holding an exhibition of gas appliances. This up to the present time is a very popular way of practically demonstrating the many uses to which coal gas can be applied as a fuel, and showing the desirability of introducing this useful agent of heat and energy into the house and workshop, and of bringing these points well under the notice of the general

* See Vol. LIII., p. 529.

public. Ocular demonstration is unequalled in the practical results which it usually brings forth.

I would, however, go farther. While to many minds the reply to the query "How shall we increase our business?" is "Advertise! Advertise!" the peculiar conditions of gas consumption are such as to justify the exhortation to "Educate! Educate!" as of equal, if not prior importance. In this matter, advertising and educating the consumers should go together; and the means adopted with either object should answer the double purpose. Supplement the advertisement and instruction afforded by the ordinary gas exhibition by the circulation of literary matter which should set forth, in concise form, such information as may be of practical utility to the consumer. Hints should be given as to the adaptability of the various patterns of gas-globes; the capabilities of the different kinds of illuminating, heating, and other burners, and of the several types of stoves; and the causes of the numerous difficulties and troubles encountered by the ordinary consumer, and their remedy. Tabulated statements of results obtained, and the attendant cost for gas, are useful as a guide and indication of what may be done by careful management. The various circumstances which are often so fruitful of waste, and consequent dissatisfaction, should be pointed out, with a view to their avoidance by the consumer. Information should also be given explanatory of the reading of the meter index—a simple matter, but one which is as perplexing to the many as it is simple to the initiated few. A pamphlet embodying these suggestions would be hailed with genuine pleasure by the bulk of gas consumers, and would also be instrumental in pushing the consumption of gas for the purposes under consideration.

A very practical and an important means of advertisement and instruction combined, is a permanent exhibition of gas appliances in or near the public offices of the undertaking. While it is unnecessary to keep a large stock of goods on hand, the assortment should be varied, and comprise all the most important of the useful appliances to be procured. I cannot agree with the plan—adopted with the best of motives by some managers—of throwing the show-room open to all and every manufacturer of gas-stoves; as the result is often disastrous. Some makers take much pride in the decorative appearance of their appliances; but do not trouble to investigate to any great extent the theory of gas consumption. Consequently, the burners are cast, cut, or moulded to some approved pattern, or by rule-of-thumb, under the direction of some small ironmonger's foundry foreman; and when the stove is in use, the result is the giving off of offensive odours, arising from incomplete combustion of the gas. This may result from the faulty construction of the burner, the too near presence of some cold supporting bars, or other error of detail. The direct causes of the unpleasantness are manifold; the indirect one is invariably a want of care in the design and construction of the burners and stove—no attention being given to the illuminating power of the gas supplied in the district in which the stove is to be used, the areas of the gas nozzle, the gas and air outlets, the cubical contents, and length of the mixing chamber, &c. The remark as to the illuminating power of the gas only applies to gases abnormally below or above the usual 16-candle quality. Ordinary burners will not prove suitable for the cannel gas supplied in London, Glasgow, and elsewhere, or for a gas of less than 14-candle power.

For attainment of perfectly satisfactory results, these and many other matters must be carefully considered, even though the resultant conditions may be perfectly incompatible (which, as a rule, they are not) with artistic results. Decorative art is important, and may with great advantage be applied to drawing-room, sitting-room, and bed-room fires, and other domestic appliances; but it should never be carried so far as to interfere in any way with the efficiency of the apparatus. I am afraid, however, that the attractive appearance of some makes of stoves is their sole recommendation to favour; and, worse still, the important matters I have alluded to are often ignored on the score of cheapness—this being the desideratum to a large class of makers. The general public do not make any pretence to be able to discriminate between the various patterns of stoves placed before them; and, as a rule, they would be chiefly guided by outward appearances. If such stoves are on exhibition in the gas-works show-room, they are considered to have the recommendation of the authorities. The status which, in the opinion of ordinary consumers, such a position thus confers is very considerable. The natural inference arrived at is that any stove thus recommended by, and to be obtained through, the gas undertaking must necessarily be satisfactory, and of the best type procurable. Any failure of apparatus thus obtained is therefore attributed to the system at large; and the whole class of apparatus is condemned. It is for this reason that great care should be exercised in the selection of the stoves to be exhibited, or even admitted therein; and bearing in mind the educational value, as regards gas matters, of these show-rooms to the uninitiated consumer, it follows that no stoves which by practical experience and careful tests, have not proved themselves thoroughly satisfactory and worthy of confidence should be allowed a place.

Then, again, respecting the show-room itself. This should be fitted up in a pleasing and attractive style, and should be kept scrupulously clean; while every provision should be made for showing to the best advantage, and in practical working operation, the various appliances on exhibition. Above all, efficient means should be provided for thoroughly ventilating the room, and immediately removing all products of combustion arising from the burners. An illustration will show the importance of this. In the course of a conversation which took place between two friends some weeks ago, the subject of gas-stoves for heating, cooking, &c., was brought up; the opportunity being taken by one of the gentlemen (a gas official) to enlarge upon their advantages from an economic and cleanly point of view. "Ah, yes," was the reply. "Very true; but how about the smell?" "Oh, under proper management, there is no smell whatever, particularly if you keep your stoves clean." "Well, then, why don't you manage it in your own show-room? If *you* can't work your stoves without disagreeable smells, how can I expect to do so? All I know is that when my wife went down to the works the other day to select a stove, the smell in the show-room was so bad that she was laid up for a day or two." For the truth of this I can vouch; the charge being a perfectly just one. The result is, as might be expected, a limited demand for stoves in a district which is peculiarly susceptible of development in this line of business. The mention of this incident will serve to bring into prominence the disadvantages under which a concern may be working when care is not taken respecting what may be termed the details of the trade.

An important suggestion bearing upon the matter of educating consumers, and one that has already, if I mistake not, been acted upon in the provinces, is the appointment of a special inspector whose duties consist in advising consumers on all matters connected with gas consumption. Such a man, if thoroughly competent, and equal in every respect to his position, would become invaluable to company and consumer alike. The matter is thus one that is well worthy of earnest consideration. The idea is fully enlarged upon in the article to which I have already referred.

Before leaving this part of the subject, I will allude to what, according to information I have recently received, is being done by one of the Metropolitan Gas Companies in order to push the trade in gas appliances—viz., the allowance of a commission to the district inspectors on all orders for stoves which they may be instrumental in obtaining. I have not the details of the scheme before me, but I understand that it has been carefully worked out, and is giving general satisfaction. While in a large undertaking it is often desirable to confine the operations of the several officers to their own departments, this is a case where the exception may prove the rule. Who should be better able to ingratiate himself and his company with the consumer than the district inspector? Numbers of these officers, taking an interest in the welfare of the undertaking they represent, would in many cases, if the rules under which they work did not forbid it, frequently add largely to the number of users of gas heating and cooking appliances by persevering canvassing and judicious inquiries. Such interest ought to be encouraged; and this could surely be done without hurting in any way the susceptibilities of other officers, or interfering with their work.

With regard to the facilities to be offered for the introduction of appliances, nothing can be better than the hire system, with the option of purchase where desired. The hire-purchase system has been worked by many provincial companies for some years, and with considerable success. The surprising thing is that there are still so many companies who are holding aloof from an enterprise so promising from every point of view.

(*To be continued.*)

The New Gas-Works at Gothenburg.—These new gas-works, which were commenced in the spring of the year 1888, are now (says the Stockholm correspondent of *Industries*) approaching completion, and will entail an expenditure of 1,000,000 kr. The retort-house has a length of 43 metres, a breadth of 22½ metres, and a height of 6½ metres. Five retort furnaces are already completed; one is in course of construction; and there is altogether room for eighteen, each with nine retorts. This part of the works will be further extended as soon as the old gas-works have been discontinued. The gasholder is 38·4 metres in diameter. The works are capable of making 30,000 cubic metres of gas per day.

Exhaustion of the Supply of Natural Gas in Pittsburgh.—An American correspondent of *Industries*, writing from New York on the 30th ult., said that at the Indianapolis meeting of the Association for the Advancement of Science the previous week, Professor Orton, the Ohio geologist, in discussing the probability of the exhaustion of the supply of natural gas, said that the supply is not only exhaustible, but is rapidly and surely vanishing. He urges the imperative necessity of cities and States taking action to restrict the wasteful use of gas; but even the strictest regulations, he says, cannot prevent the exhaustion of the supply in a few years. Within a week comes the report of a shortness of gas more general than any previous one. At Jones & Laughlin's iron-works at Pittsburgh the men are not making full time; and at the Republic Iron-Works the gas supply is short. Parties using their own wells are also feeling the shortness. Officials of the gas companies will not admit that the supply is in danger of exhaustion; but it is the opinion of many commercial men that Pittsburgh manufacturers will soon have to use manufactured gas or else return to the use of coal.

TECHNICAL RECORD.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

The Fourth General Meeting of this Association was held last Wednesday, at Yarmouth. The members were favoured with brilliant weather; and the programme of work and pleasure which had been mapped out by the Committee, with the co-operation of Mr. W. J. Carpenter, Manager of the Yarmouth Gas-Works, and Mr. F. Weller, Manager of the Gorleston and Southtown Gas-Works, was carried through in a most business-like manner. The meeting was held, with the kind permission of the Mayor (Mr. J. W. B. Johnson), in the Town Hall. The PRESIDENT (Mr. J. Barton, of Peterborough) took the chair punctually at eleven a.m., at which time there was a good assembly of members and friends.

A CORDIAL WELCOME.

At the opening of the proceedings,

Mr. W. PALGRAVE BROWN, the Secretary of the Gorleston and Southtown Gas Company, said he had great pleasure in welcoming the Association to Great Yarmouth. There was a prospect of the members having a fine day; and if their hearts were as bright and joyous as the sun, he was sure they would spend a happy time. He trusted it would not only be a happy, but a profitable day; and hoped that any efforts which their friends in the town had made to promote the pleasure of those present, would tend to add to the success of the meeting.

The PRESIDENT said he was sure the members were all very much indebted to Mr. Brown and his friends for the welcome they had extended to them; and he believed they would all agree with him that, with the lovely weather prevailing, there was every prospect of an enjoyable day. He heartily thanked Mr. Brown for his remarks.

MINUTES OF LAST MEETING.

The HONORARY SECRETARY (Mr. H. Wimhurst, of Sleaford) read the minutes of the meeting held at Peterborough in March last; and they were confirmed.

ELECTION OF NEW MEMBERS.

The following gentlemen were recommended by the Committee for election as members: Mr. J. H. Troughton, of Newmarket, Mr. W. H. Burtonshaw, of Swineshead, Mr. J. J. S. Johnson, of Southtown, and Mr. Allan Brown, of Woodford; and they were unanimously elected.

Mr. JAMES LEES (St. Leonards-on-Sea) was then called upon to read the paper given below. Before doing so, however, he said that, at the last meeting of the Association at Peterborough, he had not the opportunity of thanking the members for the kind congratulations which were then expressed towards him. After all he had passed through, he could scarcely tell how happy he was at being able to see the members again. He could honestly say that, in the ordinary course of a kind Providence, he had been restored a blessing which none could realize unless they had been without it—he referred to that of sight. Mr. Lees then proceeded to read his paper, which was entitled—

HOW TO MAINTAIN AND INCREASE THE POPULARITY OF GAS.

The subject of this paper may, at first sight, appear uninteresting; but I think it is one which affects the position and prospects of every manager of a gas undertaking; and, in bringing it before the members of the Eastern Counties Association, I do so more for interchange of opinion than for any pretention to novelty. While we must recognize with satisfaction the very valuable discoveries that have been made in the chemical conditions, together with the extensive improvements effected in the mechanical arrangements of gas manufacture and purification, most of these advantages, important as they are, can only be utilized by those who have large works under their control. To maintain the popularity and increase the uses of gas must, therefore, be interesting to all managers, however insignificant their works may be.

When Murdoch—in 1792—first lighted his house and office, at Redruth, with gas, he little thought that his labours and research would develop into such importance or popularity; for from 1802 (when the first public gas illumination was made in celebration of the signing of the treaty of peace at Amiens) until now, the course of gas from coal has been one of steady and continuous progress; and to-day the money value of the numerous gas undertakings in active operation cannot be less than £100,000,000 sterling.

Thus gas and steam have united to develop the immense and wonderful resources of our country and people. They together have also established and maintained a monopoly and popularity which time has well tested; but within the last decade, powerful rivals have arisen, which bid fair to take an important position among us. During this period electrical engineers have worked most assiduously, and with much success, to place electricity in the front as an illuminating agent—much money has been spent, and many failures experienced. But these failures have only stimulated to fresh effort.

Sir Frederick Abel, in his presidential address at the British Association meeting just held at Leeds, says: "Nine electric companies either are, or will be very shortly, actually at work supplying from central stations districts of London, comprising almost the entire western and south-western portions of the Metropolis. As regards other parts of England, there are already 27 lighting stations actually at work in different towns, besides others in course of construction, and many more projected. The prediction made by Siemens, eight years ago, that electric lighting must take its place with us as an illuminant, has thus been in a measure fulfilled; important progress is being continually made in developing and perfecting the arrangements for the generation of the supply, its efficient distribution from centres, and its delivery to the consumer in a form in which it can be safely and conveniently dealt with, and applied at an outlay which even now does not preclude a considerable section of the public from enjoying the decided advantages presented by electric lighting over illumination by coal gas. Yet our progress is slow, compared with the strides made in the application of the electric light in the United States. There, in April last, the number of arc lamps in use was 235,000, and glow lamps 3,000,000; while in England only one-tenth of the glow lamps, and only one-hundredth of the arc lamps are now in use."

The city of Bath has now a large area of streets electrically lighted, to accomplish which about 40 miles of cable have been laid underground; and 100 arc lights of 1200-candle power each are nightly in use to illumine some 50 streets and thoroughfares of the city; and, as a matter of course, a number of shops and houses have adopted the arc lamps for outside lighting, and the incandescent or glow lamps for indoor illumination. The Corporation of the city of Dublin are about to spend £50,000 on an electric installation under their Electric Lighting Act. The Lewes Town Council, too, unless they can come to better terms with the Gas Company, are considering the offer of an electric lighting company to put down an electric installation before Christmas; and during the last month, the Hastings Pier Pavilion bas been lighted most satisfactorily by 400 to 600 candle power arc lamps, displacing about 300 gas-jets.

Mr. Arthur F. Guy, in a paper that would have been read at The Gas Institute meeting at Ryde, had there been time, says: "The electric light is produced by the transformation of electric energy into heat; and to produce this electric energy, some other form of energy must be expended, whether mechanical, as by burning coal under a boiler and utilizing a steam-engine, or chemical, by burning metals in a primary battery by means of chemical action." The moral of this is that any improvement or invention that takes place in the production of the electric light will be confined to the perfecting of the details of the various apparatus now in use, or modifying the principles underlying their actions. One great improvement may certainly be looked forward to—that is, as the use of the electric light becomes more general, so electric apparatus will be manufactured in greater quantities, and with competition, at a great reduction of cost; and great improvements are to be expected from lamps.

As to cost, electric lighting at the present time varies from 6d. to 7½d. per Board of Trade unit, and is about double the price of gas at 2s. 6d. or 3s. per 1000 cubic feet—light for light. But a great reduction in the initial cost of electricity may be expected as the demand for it increases. It has been stated again and again that the difference in cost between electricity and gas is so great that we need have no fear. But let every gas manager bestir himself; for we shall, in a very short time, see that, though this rival is but in its infancy, it is fast growing in strength and popularity.

Other important rivals to coal gas are the various volatile oils now used for lighting and heating purposes by so large a number of householders in our cities, towns and villages, residing on the track of the web of gas-mains encircling their district, who prefer to use the dangerous oil, through which so many lives are sacrificed either by explosion or by injudicious handling. With oil at 7d. or 8d. per gallon, and the immense variety of elegant, useful, and cheap lamps now to be obtained, can we wonder at its popular position with the working class, while so many obstacles are in their way towards the use of gas? We have also instances of lighting committees in rural districts, when they cannot agree with the local gas company, immediately resorting to the use of oil-lamps for street illumination; but these have invariably proved miserable failures. Coal gas, however, in the face of all these facts, have maintained a unique position in our midst, both as a lighting and heating agent. But its popularity can only be maintained and increased so long as we can prove to our customers that it is not only the cheapest, but most convenient for artificial lighting and heating; and it is to establish this position I desire to direct attention.

Having, therefore, ascertained the strength and position of our opponents, let us not despise them; but, to the best of our ability, let us endeavour to show that gas can still play an important part in contributing to the comfort, convenience, and necessities of our every-day life. The primary effort of a gas manager is generally to obtain as large a quantity of gas as is possible from the coal at his command; and after extracting the residual products and eliminating the impurities therefrom, he is prepared to supply an illuminating agent at a price that will compare favourably with any rival; and which, for convenience and usefulness, cannot be surpassed. A few managers, and some directors and committees, think that when the gas is in the

mains, or, at any rate, as soon as a meter has been fixed and a service-pipe attached, their duties and responsibilities are at an end; but the time has arrived when both managers and companies must decide to take a wider range; and every step we take to maintain and develop the character and usefulness of coal gas, tends to render our industry more permanent and popular, and enables us to hold our own against all opposition. Let us then endeavour to maintain and increase the popularity of gas—first, by putting the consumer on a more satisfactory footing by advising our committees and directors to abolish the objectionable practice of requiring a considerable sum from an applicant before the company will supply gas. Burnley has set an example in this respect (which other companies would do well to follow), by refunding all the deposits they held as security for the supply of gas—amounting to more than £4000.

Another means to this end would be to abolish the scale charge for fixing meters and connecting with the main, together with the rent charged for the use of meters. The argument in favour of this course is to free the supply of gas from as many obstacles as possible; and thus popularize its use amongst those who, for various reasons, have not seen their way to adopt it. Several gas committees have of late taken this course, with very satisfactory results.

Until very recently the position and requirements of the upper and middle classes only have been considered and met; while the masses have been left out altogether. Public buildings, mills, factories, shops, and streets have, as a rule, been lighted with gas, because of the convenience of applying it; but, should not the moiety of our citizens who, with the gas-mains passing their doors, do not see their way to become gas consumers because of the restrictions, be considered and encouraged by the removal of all hindrances to their enjoying the advantages possessed by their more fortunate neighbours, without the unnecessary anxiety as to whether they can raise the amount required as a deposit, or whether they can meet the payment of the quarterly account when it becomes due. If the masses (so-called) are considered and encouraged, we venture to assert that they will—like third-class passengers on our railways—soon be the most numerous and important customers of our gas undertakings.

In order, therefore, to popularize the use of gas among the working class, we should endeavour to meet their possibilities, and recommend the taking of the meters and collecting the accounts monthly during the six winter months. The summer collection might be less frequent. Or we would meet them by collecting weekly 1s. or even 6d., and balancing at the end of the quarter with ordinary accounts. This would, of course, necessitate additional office work, and, in many cases, additional collectors; but the increased output of gas would justify the extra cost, and the arrangement would confer a great boon upon those who, under existing circumstances, are obliged to purchase lamps and a dangerous oil because of the difficulties in the way of obtaining a supply of gas.

Mr. W. A. Valon, of Ramsgate, has adopted a course in this direction which, I feel sure, will commend itself to all gas managers, and which removes most of the objections referred to. He has patented an arrangement which shuts off the supply of gas when the intended quantity of gas has passed through the meter. A simple description of the working will suffice, as Mr. Valon has kindly placed at our disposal, for use at this meeting, one of his "stop" meters. The index of this patent prepayment stop meter has an additional hand called a "stop hand," and is capable of adjustment, by means of a key, to any position, indicating the quantity of gas to be consumed and paid for, but cannot be turned backwards, and is in connection with a disc or clutch and pin, whereby, when the registering pointer of the meter has arrived at a position coincident with the stop hand, the stop action takes effect, and the supply of gas is discontinued, and no more can be obtained until the inspector has re-adjusted the stop hand or pointer. This arrangement, I believe, can be applied to any ordinary meter.

At Ramsgate a youth is told off from the office to attend to the prepayment customers; he being able to collect from about 500 houses in the course of the week. The average consumption of gas by this method is 10,000 cubic feet per annum. The price of gas to ordinary consumers is 3s. 2d. per 1000 cubic feet; and under this prepayment system, 3s. 9d., or 4½d. per 100 cubic feet. The smallest amount received for prepayment is 1s. 6d., for which 400 cubic feet of gas are at the disposal of the consumer. Mr. Valon, however, goes farther than the meter, and provides and fixes in houses under £30 rateable value, pipes and fittings, the rent of which is included in the charge of 4½d. per 100 cubic feet of gas. I am also informed that they have prepayment customers who burn 800 to 1500 cubic feet weekly, and that a large number of consumers can be secured who will burn over 1000 cubic feet per week, who cannot afford the first outlay for fittings. The Committee of the Gas Department at Ramsgate report an increase in the consumption of gas for the year of 10 per cent., which, they say, is largely due to the prepayment system.

But perhaps the most popular arrangement for small consumers would be the automatic principle—"A penny in the slot"—when, instead of buying mineral oil, always dangerous, and more or less troublesome, the consumer puts a penny or twopence into a slot, for which he can get, to use at his leisure, 25, 50, or 100 cubic feet of gas, according to prices charged in his district. The Birmingham Gas Committee have decided to try this experiment with a supply of fittings to the new model dwellings now being erected. Each tenement will also be furnished with a three-light dry prepayment slot meter (Thorpe and Marsh's patent), manufactured by Messrs. Sawer and Purves, of Manchester, who have also kindly forwarded one of their "slot" meters for inspection, with a loose attachment showing the working parts. For every penny put into the slot, 25 cubic feet of gas can be obtained; and any number of pennies—up to nine—may be inserted at one time, for which a corresponding quantity of gas will be delivered.

Another prepayment meter is in course of development by Messrs. W. and B. Cowan; and their Mr. J. L. Cloudsley has forwarded to the meeting one of his "cash-value" meters, which shows at a glance both the quantity and the cash-value of the gas consumed, and which will greatly simplify the reading. Each and all of these arrangements will tend, by their use, to maintain and increase the popularity of gas.

We are all pleased to observe how chemical engineers are continually discovering some new agent for the more effectual dealing with gas and coal products. Our constructional and mechanical engineers are providing additional and novel contrivances for the various processes of gas manufacture and distribution. Lighting engineers are producing lamps and fittings of excellent design, to suit every variety of taste—incandescent, high-power, and other burners, together with the many ingenious arrangements for the perfecting of gas illumination. Our domestic engineers are providing exquisite cookers and perfect gas-fires, and appliances for washing, ironing, and drying by gas, as well as the hundred and one other contrivances for our comfort and necessities; and, not the least important, "motor engineers" are applying gas with great success to engines for use in almost every trade or business where power is required, and even the rival electric light is produced by use of gas-engines.

Gas managers, then, have a wide field before them for the popular use of gas; and will do well to give attention to the many appliances now in the market for which gas is required—not necessarily to approve of all, but to be able to form an opinion of their adaptability for the purpose intended.

As gas companies are gradually assuming responsibility beyond the meter to the point of ignition, by the renting and fixing of gas cookers, fires, and even fittings, they ought, I think, to have some control over the size, quality, and position of the supply-pipe when fixed in dwellings and public buildings during erection—for the small and badly-laid supply-pipe is invariably the source of annoyance, when the lights, or the insufficient supply of gas is complained of; and I feel sure that all are agreed that consumers are, in many cases, not obtaining the full value of the gas consumed. If managers will, as they have opportunity, endeavour to remove the difficulties of which consumers have often just cause to complain, they will very materially assist in maintaining and increasing the popularity of gas.

The subject of the responsibility of gas companies as to fittings beyond the meter was so ably discussed at the recent meeting of The Gas Institute at Ryde, and, still more lately, at Perth by the members of the North British Association of Gas Managers, that the particulars, as reported, will, no doubt, be fresh in your memories.

In conclusion, I have endeavoured to put before you the position and growing prominence of electricity as an illuminating agent; and I am also aware of the fact that the reason of so much oil being used for lighting purposes in the dwellings of our working-class population, is because it is supplied on terms convenient to their means. The working man is enabled to purchase in small quantities, and at a small outlay, the oil and lamp now so frequently found in his home. Gas is preferable; but the conditions and restrictions hitherto imposed by gas companies have prevented its use in this direction. Let us endeavour, then, to remove the obstacles in the way, and encourage the use of the many appliances now within reach of all classes; and we shall be doing our part in "Maintaining and Increasing the Popularity of Gas."

Discussion.

Mr. W. Barratt (Grantham) said the paper which had been read was famous for two things—first, what the author had stated negatively; and, secondly, what he had stated positively. It contained things which he (the speaker) believed, and things with which he did not agree. As to the question of electric lighting, the paper referred to lights of 1200-candle power. He supposed Mr. Lees had assumed what someone else had told him as to the power of these lights. But gas managers, as a rule, were not of the number who believed in sitting down and opening their mouths, and taking in all that others sent them. Every one of them, he supposed, had been more or less confronted with the bugbear of electric lighting. But if his memory served him rightly, in every one of the places mentioned in the paper, the consumption of gas had increased, notwithstanding the employment of the electric light; so that really it was a friend to gas—and they had a right to assume that it was a friend, if it spurred gas managers on to do their duty to their employers and customers alike. Regarding oil lighting for street illumination, he was not aware of a single town where it had been a success. He knew of several places where it had been tried; but it had failed in every instance. Concerning the deposit system for gas supplies, for ten years

he worked without deposits; but he found he lost a lot of money. Now he had adopted the system; and he lost nothing. He did not insist upon a deposit, except people were strangers, and could not give a satisfactory reference; and this answered exceedingly well. Burnley had been referred to as having abolished deposits. But there the gas-works belonged to the Corporation, and they had, if necessary, the rates to fall back upon; so that it made no difference to them if there were losses. But most of the members of the Association had to manage the concerns of private companies; and therefore it was of the utmost importance that they should keep their eyes open. As to taking away the obstacles to the development of gas consumption, at Grantham they had done all that was suggested in the paper. For years they had not charged a single penny for putting in the service-pipe and meter complete to any house requiring a supply; but, nevertheless, he had something like 25 per cent. of houses in the town that did not use gas at all. What was the cause of this? It was this, that the bulk of the people resided in houses erected by jerry builders at the smallest possible expense, and the latter would not put in the requisite gas-fittings, while the people were so poor that they could not afford to put them in themselves. Thus, between the two stools, the gas company was let down. With regard to oil and electric lighting as competitors—and this was a question to which he had paid considerable attention—his firm conviction was that electric lighting was not the greatest enemy of gas companies, but that mineral oil was; and he fancied this would continue to be so until the Government awakened to the great fact that they were not doing their duty towards gas-works proprietors. Here were gas managers taxed up to the very extreme, and they had to find all the coal, materials, and labour with which to manufacture gas; and yet people in Russia and America were allowed to send oil into this country without paying a single penny. However, he did not wish to introduce politics into the meeting. As to the collection of gas accounts weekly, that was a very good idea, if it could be well carried out. But when he took into consideration that just one-quarter of the houses in Grantham—and those of the smallest description—did not consume gas, and that the laying of the service-pipe, the fitting of the meter, and the collection of the accounts weekly, would entail upon him a certain amount of expense for clerks and men, he did not think the system would be of much benefit to him. It would not increase his revenue very much, though it might to a small extent decrease the grumbling of some of the consumers. As to prepayment meters, if he remembered rightly, he hinted in his Inaugural Address last year that there was a very wide field for someone to invent a meter of this description. There were two prepayment meters in the room, and he had taken the opportunity that morning of carefully examining them. He had done his best to find fault with them, as he had had some experience with meters. He was of opinion that neither was all perfection; but he regarded them as being a step in the right direction. There were, however, some serious objections with regard to them. A man, for instance, paid 3d. for a supply of gas; and while he was reading his evening paper, the gas would suddenly become exhausted, and drop out. He would then very soon curse the gas company, and the gas too. This was a point which would have to be remedied. Mr. Valon's meter, as far as he had been enabled to judge, was undoubtedly one of the best he had seen. But it was a dry one; and he had not a very great respect for dry meters.

Mr. W. J. Best (St. Ives) observed that, with regard to the two rivals of gas, electric lighting was only indulged in by the better class of people, and oil by the poorer class. His experience was that neither landlords nor tenants of houses felt inclined to put in gas-fittings; and this was very detrimental to them as gas suppliers. On the other hand, oil was very cheap; and that was their strongest competitor. He believed in the principle of laying services and fixing meters free; but he had found that, with regard to the extension of the consumption of gas, he had done more with old consumers than with new. They were perfectly satisfied with the quality of the gas supplied; and gas fires and cookers were now largely used by them. He spoke of the respective merits of gas and coal fires; and then stated that his district was a rural one, and contained only 210 consumers. Yet he had something like 60 cooking-stoves out on hire; and not one of them had been returned. He personally canvassed for orders for stoves; and fixed them at as low a price as possible. With regard to the gas-meters which had been referred to, he admired anything that was done to augment the consumption of gas. He did not, however, quite like the prepayment meter; but he favoured the cash-value indicator devised by Mr. Cloudsley. It really seemed to be an excellent arrangement. No doubt others experienced the same thing that he did. He had some small consumers, who were always grumbling about their bills; and though the index of a meter was very easy to learn to read, they would not go to the trouble, but when the meter inspector went round to take the state of the index, they would ask him how much they had to pay. In such instances he thought that Mr. Cloudsley's indicator would be of great advantage. Then in the case of a public hall where concerts and dancing classes were held, it would be very handy, as anyone could tell the value of the gas consumed. Indeed, this indicator ought to become very popular among gas managers and consumers.

Mr. Arthur Mead (Chelmsford) remarked that a great deal had been said in the paper about electric lighting. As the members were aware, he had had some competition with the electric light at Chelmsford; and he would caution the members not to get scared by it, because it was a bogey more than anything else. Some of his friends had written to him on this matter; and there were certain of them who said they were going to send in tenders for public lighting at a very low price, in consequence of the electric light tender being accepted at Chelmsford. He wrote to two or three of these, pointing out that, when the Electric Light Company were supplying the light at 2d. per unit while it cost them 7d. or 8d., there was no need to be frightened. Messrs. Crompton and Co. had only put in the installation at Chelmsford because they wanted a job; and since they had done it, Mr. Crompton had given evidence at an inquiry at Brighton to the effect that they were supplying the light at 2d. per unit, but a local authority might be able to furnish it at 6d. The arc lamps in his town gave a very good light; but the incandescent lamps had a reputed light of 32 candles, which, he found, dwindled down to what a 4 cubic feet burner would give with 16-candle gas.

Mr. A. Mitchell (Bury St. Edmunds) said that there was no need for fear in regard to the lighting of streets by electricity—as for that purpose it was thrown away. The fact that corporations were going in for this sort of thing did not prove that they were getting the best value for their money. Corporations were not famed for doing wise things in the way of spending money; and, in his opinion, the ratepayers should compel them, before making a change from gas to electric lighting, to show that some profit would accrue to the town. The electric light was a fact. It was a triumph of what he might call "scientific mechanics." Science had given them the electric light; mechanics had produced the engine with which to generate and supply it. The electric light was a light of luxury; and it would be adopted just as a man started his carriage and pair, where at one time he was content to take a cab. No doubt the electric light would be utilized in business premises and large houses. Civilization was growing, and with it people were willing to adopt many things which years ago they would never have thought of, simply because they could afford dearer articles; but this would not drive the cheaper things out of the market. As suppliers of illuminating gas, they had nothing to fear from the electric light. It might find its level; and then it would be a question of buying and selling, and the wise buyer would know what to purchase in order to get the best value for his money. At the same time, it would not affect gas companies substantially. For street purposes electricity was simply unjustifiable extravagance. It was all very well for corporations who were lighting their streets by electricity to say they were well illuminated; so they would be if gas was properly used. Of course, the streets were superiorly lighted by electricity; for they spent a great deal more money on it. Were they to expend the same amount on gas, then any unskilled man would be able to say that the streets were better lighted than by electricity, and that the gas was the more reliable of the two. The objections which were raised to gas for interior lighting were not applicable to outdoor lighting. Besides, the light was better diffused from gas-lamps—in fact, gas was altogether superior, if it only had fair play. Nor did he think that gas managers had anything to fear from electricity for interior lighting. As to oil, taking everything into consideration, it was not a cheaper lighting agent than gas. There was great risk attaching to oil-lamps, they were inconvenient and troublesome, and they emitted a very objectionable smell; and if consumers would look at the question in the true light, it would be seen that gas was the cheaper and more serviceable. Gas companies would, of course, have to put up with competition, as many other trading concerns had to do. For many years gas companies thought their business was secure, and they became somewhat indifferent. But electricity and oil had brought them to the front; and gas lighting was never so successful as at the present time. He proceeded to advise gas managers to impress upon their consumers to use only good governor burners, and urged them to remove as many of the difficulties as possible which were helping to impede the development of gas consumption. The question of meter-rents was one which had been discussed for many years; and he thought on the whole it was right to do away with them. The consumer should have free services, and then an ample supply of gas for every purpose. As to the subject of deposits, this really concerned managers in towns where there was a working-class population. From past experience, he knew that, if they wanted to conduct their business on a financial basis, and not lose money, it was necessary to take a deposit from a certain class of people; and personally he would rather be without those customers, as he would not throw his Company's money away on anybody. As to prepayment meters, he had little faith in them; but he liked the idea of showing at a glance on the face of the meter, the money value of the gas consumed. He thought that might come to the front in all classes of meters. As they were well aware, gas consumers very often complained that they had not burned the quantity of gas charged for, and called attention to the difference between the amount of their bills and those of their neighbours. If they could show them the cash-value of the gas they were consuming, he believed they would then take

the trouble of looking at the meter more frequently than they did now. As to fitting houses with pipes, he remarked that it seemed a very curious thing that houses of £25 rental should not be fitted up by the landlord; and he suggested that managers should offer to supply good pipes at a cheap rate. It was a great drawback not having fittings in houses, as tenants did not care to spend £3 or £4 on them. Continuing, he said that gas companies had now cooking and heating stoves, and gas-engines to fall back upon, which in the pre-electric lighting days they never thought of to any great extent. Gas was as necessary now for cooking and engine power as it was for lighting (as was indicated recently at Leeds during the lock-out, when all the gas-engines had to stop working), and, in fact, it was as great a necessity as water. The more they realized this, the less fear they should have for their rivals; but let them never pooh-pooh anything. If the worst came to the worst, their shareholders must take less dividend. There was no doubt they would maintain their own; but they would have to keep their eyes open. Gas was never used so much as in the present day; and gas managers would hold their own if each one personally looked after the business he had to supervise.

Mr. J. Carter (Lincoln) said he thought the paper and discussion brought home to them the fact that they were surrounded by powerful rivals—competing forces—and the effect of such a paper was to convince gas managers that they must be up and doing, and trying their utmost to extend the business with which they were associated. Mr. Barratt had referred to the alleged candle power of electric lights. He (Mr. Carter) was of opinion that it would have been quite proper for the author of the paper to have inserted the word "alleged" before the figures he had quoted. He questioned the wisdom of submitting figures of this kind, unless there was good reason to believe the estimates given were as accurate as the Gas Referees required in regard to the quality of the gas supplied in London. As he said last year at the Ipswich meeting, the great competitor they had to deal with was oil. But with gas at 2s. 6d. per 1000 cubic feet, or, to put it at an average figure, at 3s., he did not think, with all the incidental expenses attaching to oil lighting, that the latter would be cheaper than gas used with intelligence and ordinary care. A friend of his at Lincoln had, consequent upon removing just outside the district of gas supply, to adopt oil-lamps. He had the advantage of using oil, bought of the best makers, in large quantities at a time; but he assured him (Mr. Carter) that, having kept a careful account of the cost incurred, compared with the previous expenditure for gas, he found it far more expensive and inconvenient.

Mr. H. Wimhurst, having thanked Mr. Lees for his paper, said that some ten years ago they started the system of supplying fittings to houses, and charging, as rent for them, 10 per cent. on the actual cost. This was not very successful; only about half-a-dozen houses being so fitted up. They, however, continued to let out cooking and heating stoves on hire; and the results had been very gratifying. In the period from 1880 to 1887, the consumption of gas nearly doubled; but since then they had remained almost at a standstill. In order, however, to popularize the use of gas, they had held two gas exhibitions, from which they met with some success—especially from the first; and he was hoping, now that they had reduced the charge for gas down to 3s. 4½d. and 3s. 9d. per 1000 cubic feet, they would continue to progress. About 20 per cent. of the consumers at Sleaford used gas-cooking stoves; and this was fair evidence that, although it was a small town, the consumers appreciated the value of gas for cooking purposes.

The President congratulated Mr. Lees upon the useful paper he had read. Taking it generally, he agreed to a great extent with its contents. As to electricity, he did not regard it as an opponent to coal gas, but as a light which would create a demand for additional light. Wherever electricity had been adopted, it was found that the gas supply did not suffer in the least. Respecting the deposit question, he quite agreed with doing all that was practicable to extend the consumption of gas. Of course, if a stranger came into the town, and required a supply of gas, he thought it right the Company should have some security for it; but in the case of tradespeople occupying a respectable position, and having a good reference, the matter was different. At Peterborough they had about 1600 consumers, and the deposits only came to about £40; while the bad debts amounted to £25 a year. This, he considered, was a very low percentage. In regard to prepayment meters, he did not agree with the principle at all. He was one of those who did not believe in people paying for anything until they obtained it, nor did he think the plan would become very popular. The meter brought out by Mr. Cloudsley was a step in the right direction; and it was certainly an invention that perfected gas-meters. In his opinion, meters had hitherto been anything but perfect; and if by any means they could get poor people to read their meters, and see for themselves the value of the gas they consumed week by week, it would be a good thing. Under the present system, consumers would not read their meters; and a state of confusion arose which was anything but satisfactory. He also characterized oil as the strongest opponent of gas; and said he should like to see the price go up a little, so that the two illuminants might be on a fairer footing.

Mr. Lees, in replying upon the discussion, said that whatever remarks Mr. Barratt might make, as a veteran in the gas industry, they must be respected. With regard to the illuminating power of the so-called 1200-candle electric lights, he might say that, in nineteen cases out of twenty, they did not exceed half the power stated. At Hastings, the light obtained from a 1200-candle power lamp could not, he was satisfied, be more than 400 candles. Nevertheless, it was a very good light. In the Pier Pavilion, the gas-lamps had been displaced by four 1200-candle lamps, which illuminated the whole of the building in a most satisfactory manner. Still, as Mr. Barratt had pointed out, the gas consumption had increased at Hastings during the past twelve months. With reference to oil lighting, he had himself lived outside the area of gas supply, and so could speak from experience. He found that gas at 3s. 4d. per 1000 cubic feet, as at Hastings, was really cheaper, and it gave a better light, than oil at 8d. or 10d. per gallon. As to the meters before the meeting, he said that time alone would show whether Mr. Cloudsley had taken the right step. Regarding the prepayment system, Mr. Valon assured him that at Ramsgate they had now 400 customers under it; and they could have a great many more if the Corporation liked to entertain their applications. In conclusion, he thanked the members for the kind reception given to his paper.

Mr. J. E. Buckle (Woodbridge) then read the following paper:—

ON GENERAL MATTERS CONNECTED WITH THE WORKING OF SMALL COUNTRY GAS-WORKS.

Having been invited by our worthy Secretary to make a few remarks as to my working at the gas-works, Woodbridge, Suffolk, where, as I daresay many of the members present will fully comprehend, the Manager has to be a little of everything, from engineer to stoker, I propose to point out a few matters in my experience that may be of interest to the majority of our members, at least to all those in a similar position.

The most important point in all gas-works is the cost of the raw material; and the present enhanced price of coal, and especially of cannel coal, which has been considered a necessity where the gas must be kept up to a 17-candle standard, led me to consider how to get the best possible returns from dearer materials. I am pleased to be able to show that, with little trouble and expense, the use of cannel may be entirely dispensed with; and yet the quantity and quality of the gas maintained at a high standard from ordinary gas coal.

Doubtless many of the gentlemen present noticed my letter in the Journal of Gas Lighting for May 20 last, in reference to the use of coal tar as an enricher of gas without the need of using cannel coal; but I now propose to give the result of some further regular working with that despised material. My first trial or experiment, early in May last, gave such a favourable result that I have continued the use of tar in regular work ever since, and have no reason to abandon it or to require any cannel. The details of a very careful experiment, using a bed of five retorts at good heats, are as follows: Coal used, 570 lbs.; being small dust coal—the sweepings of the coal-store—mixed with 102 lbs. of coal tar taken direct from the tar-tank, making together 672 lbs., or 6 cwt. The small coal and tar well mixed, turned over and worked up, was charged into the five retorts; giving about 135 lbs. to each retort (a very light charge), and was worked off in six hours, as in regular routine. The production of gas was 3515 cubic feet, or more than 11,700 cubic feet per ton of the mixture; and the quality, over 18 candles. The coke produced was 441 lbs. (3 cwt. 3 qrs. 21 lbs.) of hard, good quality—a little over 13 cwt. per ton. I leave these figures to speak for themselves.

The coal I use is Pelaw Main; but with a considerable quantity of small (dust coal) in it. I employ an exhauster, driven by a small gas-engine, working at 1 inch of vacuum in the vacuum gauge, and after the condensers; the dip in the hydraulic main being 1½ inches. I obtain, in the ordinary way of working, 10,200 cubic feet of gas per ton of coal, using formerly such a proportion of cannel as to keep the gas well up to the normal 17-candle standard. Our cannel would now cost us about 40s. per ton; and I therefore purpose dispensing with it and depending upon tar entirely for enrichment. The result of a week's regular working (ending May 10) with tar as an enricher was: Coal, 13 tons 18 cwt.; tar, 70 gallons, or an average of 5 gallons per ton of coal. Beds of seven retorts, charged with 11 cwt.: Gas produced, 151,900 cubic feet, averaging over 10,850 cubic feet per ton; the quality being 18 candles. Taking another week (ending Aug. 9), using seven retorts with six-hour charges: Coal, 14 tons; tar, 80 gallons; gas produced, 150,600 cubic feet; quality over 17 candles; and the average production per ton of coal, 10,755 cubic feet. It will be noticed that this is not so good a result as the week in May. But it is easily accounted for by the fact that the bed was newly set, the heats had just been got up, and were not up to the mark; while to obtain the best results when using tar, I find in practice that the heats must be good—in fact, what may be called "high."

My retorts are Gibbons's machine-made ones, of good quality, 21 in. by 15 in. by 8 ft. 2 in.; and during last year I produced, with fourteen retorts in use, 11,236,700 cubic feet of gas from 1075 tons of Pelaw Main coal and 20 tons of cannel—no tar being then used. This is an average of more than 10,260 feet per ton, and a result never before obtained in my works.

I have now adopted a simple mode of supplying air to burn the gases from the furnaces over the arches in the retort-beds,

by inserting short lengths of 2-inch cast-iron pipe through the front wall, and which, I believe, answers well, and proves an economy in fuel. The quantity of air supplied is very easily regulated by more or less stopping up the socket end of the pipe projecting outside the bed; while the central heat in the bed is greatly improved, and entirely under control. Perhaps some of our members will try this, and report the results. The expense is nominal. I would, of course, prefer to supply hot air on the regenerative system; but then the expense of the new arrangement has to be considered, as in small works every such item of outlay for improvements or additions shows much more prominently in the balance-sheets than they do in those of large works. The managers of small works are not idle in the matter of improvements, but have not the means to carry out all experiments and improvements they may devise like their brethren in larger establishments. The former are sadly handicapped in every way; and, as a rule, very poorly paid for their services. To my knowledge, it is no unusual thing to hear of men being asked to take the somewhat responsible position of gas manager of small works at from 15s. to 20s. per week—mere labourers' wages—and yet the directors of the company owning such works expect the necessary knowledge, skill, and experience from their manager to enable them to earn a good dividend. It is no matter for surprise then when such works are for sale after a short term of such "economy!"

Every gas manager knows full well what care and responsibility devolves upon him in small works, where he has to attend to every detail himself, with the assistance of only a couple of stokers. I fancy that if some of the engineers of our large works had but a week's experience of the management of a small one, they would be better able to appreciate the efforts of the small manager, and not expect from him the same regularity in quantity and quality of gas that may be obtained in a larger concern. The engineer of a large works, for a bad night's make, can call to account the foreman of the retort-house; but the small works' manager has no such recourse, and has often to be about his works both day and night, and yet at the call of every individual consumer.

I, however, quite agree with what Mr. Travers, of Cork, says in his paper read before The Gas Institute, and published in the JOURNAL for July 1 last—that a gas company should have or take a greater interest in the gas beyond the meter than is generally the practice, and that the time has come when companies should see that their consumers not only have the quantity and quality of gas they pay for, but are shown how to use it in the best and most economical way, giving advice gratis in all matters relating to fittings, stoves, and burners, as the latter especially are often bad and unsuitable, causing an extravagant consumption of gas for a poor light, which disgusts the consumer, and eventually acts to the prejudice of the gas company. The consumer is, however, as a rule left to his own devices, or to the mercy of the itinerant gas-burner vendor and the local fitter or ironmonger, with the result, in many cases, that the gas bill is not commensurate with the light he obtains, while in his estimation it is the meter, the gas, or the company who are entirely to blame. A little advice by means of a few handbills distributed amongst consumers would correct much of this misapprehension, and materially reduce the usual complaints of "bad gas," "no pressure," "meter wrong," &c.

One difficulty in the matter of obtaining a number of small consumers in country towns is the item of meter-hire; and I think it good policy to have it altogether abolished, as I have managed to do at Woodbridge, to the advantage, I believe, of the Company as well as to the content of the consumer, who, as a rule, looks upon the charge somewhat as a person would do who went to a shop or store, and was there charged so much for the goods, and so much for measuring them in addition. I daresay many of you have had the difficult point to argue with a consumer whose meter-hire for the summer quarter amounted to about as much as the gas, while at the same time he declared that he had not lit a burner during the term. You will perhaps agree with me that it would considerably lighten your troubles if there was no charge for meter-hire; while in the present competition with oil lighting, the companies would find an advantage therein.

Discussion.

Mr. MITCHELL said that the Secretary had asked him to read a paper; and he replied that he could not, as he had nothing new to say. But here they had Mr. Buckle, who had charge of smaller works, coming forward with a paper which was deserving of some notice on the part of the members. He understood that Mr. Buckle added 5 gallons of tar to the coal carbonized, and that the production was 10,850 cubic feet of 18-candle gas. The question seemed to him to be a financial one: Was it worth using 5 gallons of tar, in order to increase the make of gas by 650 feet per ton and the illuminating power by 1¼ candles? He considered it would have been better to have employed a higher-class coal, instead of the tar.

Mr. BARRATT inquired if Mr. Buckle could tell him the specific gravity of the gas before and after using tar, and whether he found any difficulty with the pipes on the works, or in any part of the town. In his opinion, the specific gravity of the gases would differ. He had made some tests, from which he found that one gas was heavier than the other. According to the state of the atmosphere—whether it were high or low—the specific gravity of the gas varied; and if it did so, there would be sure to be some difficulty. Mr. Mitchell had referred to a matter on which he intended to speak. Supposing for this 5 gallons of tar they could get 4d. per gallon, and that a better class of coal could be obtained instead for (say) an additional 1s. 6d. or 2s. per ton, then he could not see that there was much advantage in adopting what Mr. Buckle advocated.

Mr. LEES suggested that perhaps the two previous speakers had means for disposing of their tar to much better advantage than Mr. Buckle. If this were so, he agreed with Mr. Buckle's efforts in trying to utilize something he could not otherwise get rid of, in order to enrich his gas. If he could obtain 4d. per gallon for the tar, he would do exceedingly well; but the likelihood was that he would not realize more than 1d. or 2d.

Mr. CARTER mentioned that Mr. Buckle promised with very great reluctance to prepare a paper, but this arose more from a sense of modesty than of any want of something interesting to write about. He had shown in the paper what could be done with tar if it were to "bump" down again to 7s. per ton. Mr. Mitchell had, he thought, summed up the gist of the whole thing, when he said it was purely a question of £ *s. d.* By using 5 gallons of tar, he gathered that Mr. Buckle saved what he used to spend in cannel; and if he could inform them what he previously expended in this way, an exact comparison might then be made.

Mr. BEST said he could not commend the use of tar in the retort-house. He had tried it, and found that it made everything dirty; and so he abandoned it in despair. He noticed in purifying the gas, at the time he used tar, a very peculiar yellow discoloration of the lime in the purifier; and he asked if Mr. Buckle had observed the same thing. He proceeded to point out that gas of between 16 and 17 candle power was the best for all purposes; as, if it were of higher quality, it would produce smoke when consumed in a regenerative lamp.

Mr. W. DUESBURY (Cambridge) said he saw Mr. Buckle's letter in the JOURNAL OF GAS LIGHTING, on the subject of using tar for enriching gas. He had since tried it; but he failed to obtain such good results as were claimed by the author. He believed that he only realized an increased production of about 200 cubic feet per ton, and an additional illuminating power of ⅓ candle; but in his case he had five-hour charges of 1¾ cwt. each. Of course, the variation in the charge might have made a difference in the results; but, from his experience, he did not think it worth while continuing the experiment.

The PRESIDENT thought that Mr. Buckle's paper would be a very useful one if the price of tar went down to the level of three years ago, when they could scarcely give it away. It would then be very useful indeed to use tar in this way, so as to keep the excess out of the market. The point raised by Mr. Barratt was one which required to be threshed out; and this, he thought, could only be done by experimental tests of the gas, at different periods, as it left the hydraulic main.

Mr. BUCKLE said, in reference to Mr. Mitchell's remarks, that he had to send his gas about 2½ miles from the works; and it was there that the analyst tested it. Therefore to keep on the right side, they previously found it necessary to use cannel coal. Before using a proportion of cannel, they could only produce from 14 to 15 candle gas; but in order to ensure that the illuminating power should be above the standard at the place where it was tested, they found it essential to make it of from 15 to 17 candle power. As to Mr. Barratt's question in regard to the specific gravity of the gas, they had no means of testing this at his works, where they only made about 11 million cubic feet a year. With respect to stopped pipes, he said that they had not been troubled with one for some time. Having referred to the condition of the Woodbridge works when he took charge of them, he spoke of the improvements which had since been effected; and concluded by confessing that when using tar (which he did intermittently) the lime in the purifiers did turn a little green.

On the motion of the PRESIDENT, seconded by Mr. WIMHURST, a vote of thanks was passed to Mr. Lees and Mr. Buckle for their interesting papers.

ELECTION OF OFFICE-BEARERS.

The PRESIDENT then proposed, and Mr. BARRATT seconded, the election of Mr. Carter as President for the ensuing year; and the proposition was unanimously agreed to.

Mr. CARTER, while thanking the members, said he wished the honour had been conferred upon someone else; but he did not want the members to go away with the idea that he did not appreciate it. He should certainly not attempt to fill a position of this sort, except for one thing, and that was that they had a kind and efficient Secretary in Mr. Wimhurst, who assisted the President to a great extent in the proper discharge of the duties appertaining to the chair. He thanked the members warmly for the confidence they placed in him.

On the proposition of Mr. WELLER, seconded by Mr. A. J. YORSTON (Ely), Mr. Arthur Mead, of Chelmsford, was unanimously appointed Vice-President.

Mr. MEAD thanked the members for the distinguished honour they had conferred upon him. When he was approached on this subject by their worthy Secretary some time ago, he told him that he could have wished the honour had been postponed to some future period, as up to the present time he had done so little for the Association.

The PRESIDENT next proposed, and it was seconded by Mr. BUCKLE, and carried unanimously, that Mr. Wimhurst be re-elected to the secretaryship.

The SECRETARY, having expressed the pleasure he derived in serving the Association, read a telegram and also a letter which he had received from Mr. G. Garnett, of Ryde, in which he stated that he deeply regretted not being able to attend the meeting, owing to the serious illness of his wife.

On the motion of the SECRETARY, seconded by Mr. LEES, Messrs. Yorston and Weller were then re-appointed Auditors of the Association accounts.

The SECRETARY also proposed that Messrs. E. J. Brockway (Oakham) and A. Mitchell (Bury St. Edmunds) be elected to the Committee in place of the retiring members.

Mr. C. W. GRIMWOOD (Sudbury) seconded the motion; and it was unanimously carried.

Owing to the election of Mr. Mead to the vice-presidency, a vacancy occurred on the Committee; and it was moved by Mr. YORSTON, seconded by Mr. BEST, and agreed, that Mr. Grimwood be elected to fill the position.

PLACE OF NEXT MEETING.

On this matter being introduced,

Mr. CARTER, the President-Elect, proposed that the next meeting should be held at Lincoln. It would, he said, give him great pleasure to do everything in his power to make the visit both profitable and entertaining.

Mr. MEAD seconded the proposition; and it was agreed to.

A VOTE OF SYMPATHY.

Mr. CARTER said that before the members separated, he should like to propose that Mr. Garnett's telegram and letter be acknowledged, and that the Secretary should express the sympathy of the members with him in his great ordeal.

Mr. BARRATT said he rose with mixed feelings to second the proposition. Everything they could do to ameliorate the mental suffering of Mr. Garnett ought to be done.

The proposition was unanimously passed.

VOTES OF THANKS.

It was proposed by Mr. BARRATT, and seconded by Mr. DUESBURY, that the best thanks of the members should be tendered to the Mayor for kindly allowing them the use of the Town Hall for the meeting that day.

This having been agreed to,

The thanks of the members were heartily accorded to the President and Hon. Secretary for their services during the year,

The PRESIDENT made a suitable reply; and this concluded the business on the *agenda*.

VISIT TO THE LOCAL GAS-WORKS AND TO SOMERLEYTON.

After a light luncheon at the Duke's Head Hotel, the members proceeded by coaches to the works of the Yarmouth Gas Company, where they were received by the Engineer (Mr. W. J. Carpenter) and the Secretary (Mr. C. Panchen), the former of whom conducted the visitors round the buildings and courteously gave information required by them as to the various portions of the plant. Entering the retort-house first, it was seen that it contained 24 beds of retorts (in all 144 retorts). Mr. Carpenter spoke very highly of his furnaces, which are on Dougall's regenerative system, with Cutler and Dougall's patent frames He obtains splendid heats with them; and he gave an excellent account of them as regards durability. In the exhauster-room there is one of Donkin's modern machines; but the remainder of the plant there is rather old. In the purifying-house there are four boxes, about 19 feet square. With regard to the condensing plant, Mr. Carpenter has in use one of Morris and Cutler's condensers, the working of which he greatly praised. The governor-room is nicely fitted up; and has in the centre one of Messrs. W. Parkinson and Co.'s governors. The station meter is rather too small for the make of gas; being only of a capacity of 30,000 cubic feet. It was observed, however, that it has been in use since 1869, in which year it was erected by Mr. John West. There is ample storeage room on the works; the gasholders, of which there are five, being of the following capacities: 400,000, 130,000, 100,000, 60,000, and 45,000 cubic feet. Mr. Carpenter is provided with a testing and photometer room, containing one of Sugg's "Imperial" photometers.

Having completed their survey of the Yarmouth works, the members were driven to those of the Gorleston and Southtown Gas Company, which are under the charge of Mr. F. Weller. The works are small, but well appointed; and Mr. Weller was complimented upon the neatness which prevailed throughout the place. The retort-house contains five beds of six retorts; and there are two well-constructed gasholders each of a capacity of 62,000 feet. The annual output is about 14 millions.

The members having retaken their seats on the coaches, were then conveyed, through some fine country scenery, to the seat of Sir Saville Crossley, Bart., M.P., at Somerleyton. The extensive grounds and gardens are beautifully kept, but the large and well-stocked conservatories formed the centre of attraction to the visitors, and were greatly admired.

After a pleasant journey back to Yarmouth, the members and friends dined together at the Duke's Head Hotel; the Mayor honoring the Association by his presence as the guest of Mr. Barton.

THE SHEFFIELD WATER-WORKS.

At the recent Meeting of the Institution of Mechanical Engineers at Sheffield, Mr. E. M. EATON, the Corporation Water Engineer, read a paper descriptive of the works under his charge. In the course thereof, he said:

Sheffield is supplied with water by gravitation from the elevated moorlands lying to the west and north-west, the gathering-grounds forming part of the western slope of the backbone of England. The rainfall has been continuously gauged for the last 54 years, and averages rather more than 40 inches in depth per annum. It has been ascertained from actual experience, that during a period of three consecutive dry years, nearly 20 inches of this can be collected, stored, and distributed.

The system of reservoirs may be divided into the high level and the low level; the distinction having reference, not to the absolute height above the sea, but to the means available for conveying the water from the storeage reservoirs into the various service reservoirs near the town. The high-level reservoirs are situated at Redmires, about six miles in a direct line from the centre of the town, and were among the earliest of the large works constructed by the Sheffield Water-Works Company. They consist of three reservoirs—the Upper, Middle, and Lower Redmires—with the Oaken Clough dam and catchwater. They receive the flow from 2108 acres of drainage area, and have a total storeage capacity of 670 million gallons; the gathering-ground comprising the upper part of the valley of the River Rivelin. The water from the high-level reservoirs is conveyed down a watercourse, open for the greater part of its length, but covered in at the lower end, into the Hadfield or Crookes service reservoir, having a capacity of more than 21 million gallons, whence the supply is taken for the higher parts of the town. The low-level system comprises two reservoirs upon the Rivelin, originally constructed for mill compensation purposes, in consideration of water taken from the high-level system. Under the Sheffield Water-Works Act of 1853, these Rivelin reservoirs reverted to the Water Company; compensation to the stream being provided for by the flow, over a notch-gauge or weir, of 7 cubic feet per second during 24 hours of every working day. The other portion of the low-level supply is composed of four reservoirs in the adjoining valley of the River Loxley; these being the Strines, Dale Dyke, Agden, and Damflask reservoirs. There is also upon the Rivelin, immediately above the mill compensation gauge, a small reservoir called the "depositing pond," constructed for the purpose of regulating the flow of water for the mill gauge. The total capacity of the low-level system of storeage reservoirs is more than 3000 million gallons. The Water Engineers responsible for the large and important reservoirs upon the Loxley have been Messrs. T. and C. Hawksley. In the Rivelin valley the depositing pond, also constructed by Messrs. Hawksley, is principally remarkable for its fine overflow weir and bye-wash, capable of conveying away the heavy floods which are occasionally discharged from the area of nearly 5000 acres draining down to this point.

In the Loxley watershed, the first reservoir constructed was that upon the Agden Dyke, having a storeage capacity of 629 million gallons, the embankment being nearly 100 feet high, and containing 900,000 cubic yards of material. The water is drawn off from the reservoir by means of a valve-shaft and a culvert laid through the bank, controlled by two valves which are worked by gearing upon the top of the shaft. From the outlet culvert the water discharges into a gauge basin, where provision is made by means of a slot gauge or orifice for passing a measured quantity of compensation water down the stream. The measuring opening or slot is made capable of accurate adjustment by sliding jaws of steel, which, when adjusted, are locked by two paddocks. The key of one is in the hands of the clerk to the mill-owners, while that of the other is kept at the water-works office. It therefore requires the consent and presence of both parties to make any alteration in the measuring apparatus. The same description of slot-gauge is in operation at each of the four reservoirs upon the Loxley. The Strines reservoir, at the head of Bradfield Dale, has a bank 418 yards in length; the water being drawn off by means of a shaft and a culvert through the bank. This embankment, in common with those of the other Loxley reservoirs, has an inside slope of 3 to 1; the outer slope is 2½ to 1, and is strengthened by level benchings. Immediately below the Strines reservoir is the Dale Dyke reservoir, upon the site of, but considerably smaller than, the ill-fated reservoir which was destroyed by the disastrous inundation of March 11, 1864. The embankment which was then destroyed crossed the valley obliquely, about a quarter of a mile below the present bank; and before the reservoir was completely filled with water a landslip led to a settlement in the outer slope of the embankment, causing the puddle wall to subside and the water to flow over the top of the bank. In a few minutes the reservoir was destroyed, and the valley down to Sheffield was inundated; causing the death of 244 persons, and the destruction of an enormous amount of property. The Water Company paid no than £373,000 in respect of injury and loss sustained; the the disaster being happily unique so far as regards this country. The embankment for the new reservoir was made higher up the valley, in order to avoid the treacherous ground upon which the old bank stood; but it may be interesting to state that the pipes which ran under the old bank, and which were alleged to have

caused the disaster, are still in the ground, and are as tight and strong as they were on the day they were laid. The water is drawn out of the present reservoir by means of a tunnel driven through the solid rock round the end of the embankment. Two valves are provided, one behind the other; and the gearing for working them is placed in a small house near the overflow weir. The outlet from the tunnel is in a line with the foot of the bye-wash. This reservoir was completed and filled with water in 1875; but was not found necessary to be brought into use until the exceptionally dry year of 1887. Rather more than a mile below this reservoir, and at the junction of the Dale Dyke with the Agden Dyke at Low Bradfield, is the mill compensation gauge, over which is passed, for the use of the mill-owners, a quantity of water equal to 10 cubic feet per second during 24 hours of every working day. In a small house alongside this gauge there is a recording-machine, designed by the writer, for the purpose of continuously measuring the water flowing over the gauge-bar. Immediately below this gauge is the tail-end of the largest, and in some respects most important, reservoir belonging to this undertaking—the Damflask reservoir, which is the lowest upon the River Loxley, and has a storeage capacity of 1158 million gallons, with a depth of water of 85 feet. The water is drawn off by means of two culverts through the bank, each provided with a valve-shaft on the inner end. Having regard to the great size of the reservoir, the embankment is not long; but the works in connection with it are enormously heavy and costly. When the reservoir is filled with water up to a certain height, it has been ascertained that a band of rock upon the south side allows the water to pass through the joints and fissures, to re-appear as a spring at the bottom of the embankment. It was foreseen that this might prove to be the case; but as it was uncertain what the quantity of water passing might be, it was considered better to defer remedial measure until the reservoir was filled and proved. To stop this percolation, a wing trench is being cut through the pervious rock into the underlying shale, which will be filled with puddle, and so stop the water from passing away. At the foot of the embankment is placed the mill compensation gauge-weir, having three slots or openings similar to those already described; while in a little house adjoining is another recording gauge, similar to that at Low Bradfield.

After leaving the storeage reservoirs and being received into the service reservoirs at Crookesmoor, the water is distributed throughout the town and district of supply by means of main-pipes from 24 down to 5 inches in diameter, laid in zones. The service-pipes are mainly 4 inches in diameter; 3-inch pipes being laid in short streets and courts. The total length of the distribution-pipes is nearly 300 miles. The total daily quantity of water sent out is about 6¼ million gallons, of which exactly one-third is for trade and manufacturing purposes, or for supplies in bulk to local authorities distributing the water themselves. When water was first supplied to Sheffield under constant pressure in 1869, the daily consumption was 40 gallons per head of the population supplied, of which only about 2¾ gallons per head was for trade purposes. Now, and for many years past, the quantity consumed, without restriction or limitation, for all purposes other than meter supplies, has averaged not more than about 13 gallons per head per day. This happy result is due to the rigorous rejection, so far as practicable, of fittings and apparatus of an inferior character, combined with unceasing vigilance in suppressing all unnecessary waste of water. At each of the service reservoirs a self-recording gauge, similar in construction to those at Low Bradfield and the Damflask reservoir, is fixed for the purpose of measuring the water supplied to the town. These recorders have been in use since 1878; and the result of their working has been to disclose several facts relating to the supply of water, of a character very interesting to all engaged in the practical management of water-works.

The author then explained two diagrams he exhibited—one showing the average draught of water during 24 hours, starting from midnight, for the period of twelve years from 1878 to 1889 inclusive; and the other showing the hourly percentage on the draught. From the second diagram it is apparent that, so far as Sheffield is concerned, the least draught upon the reservoirs is between three and four o'clock in the morning; the maximum draught being between eleven and twelve at noon; while the fact of the stoppage of work for dinner between twelve and one o'clock is strikingly manifested. The diagram further indicates that in proportioning pipes for town supply, although the average daily flow through them may be taken at 100, yet provision must be made for passing 50 per cent. in excess of this quantity.

In connection with the system of pipes for water supply, it may be interesting (Mr. Eaton said) to compare the two specimens exhibited, each being 5 inches inside diameter. One of these is the modern cast-iron pipe, as now laid in the streets of Sheffield; the other is a wooden pipe formerly used, which was taken out of the ground during May last, after having probably lain there for nearly, if not quite a century. These wooden pipes were upon the Water Company's premises; and the last of them was made about 60 or 70 years ago. The water supplied to Sheffield may be taken as a fair type of the excessively soft upland waters supplied to many of the large towns in the North of England. The hardness varies at different periods of the year; rarely falling below 2°, and seldom exceeding 3° of Dr. Clark's scale. The extreme energy displayed by these soft waters in attacking metals exposed to their action is well shown by the specimens now exhibited of wrought-iron screw-spindles, nuts, bolts, and washers These have been wholly immersed in the water to a considerable depth for a period of more than 40 years; and the mannel in which the pure metal has been eaten away is most remarkable. It has been found also that steel blades, such as razors, scissors, pocket and table knives, and also files, suffer complete deterioration to a considerable depth from the surface of the metal when immersed in the water for several years. This has been proved by the recovery from time to time from the reservoirs of bundles of such steel articles, which had doubtless been placed there in connection with trade outrages in times past. The steel was found to have become converted into plumbago; whole bundles of blades being capable of being scraped away with a penknife. This fact should induce caution in the use of cast steel when wholly and continuously immersed in water of this character.

The Corporation of Sheffield supply water to more than 320,000 persons. The revenue from water-rates is £90,000 per annum. The capital cost of the undertaking, as shown by the accounts to March 25, 1890, has been upwards of £2,115,000.

In the course of the discussion on the paper, Mr. E. B. Martin mentioned cases which had come under his notice in which deterioration of boilers had resulted from the excessive purity of the water used in them. A remedy was found in the introduction of lime. Sir L. Bell said there must be something at work quite independent of the character of the water, as a boiler might be corroded at certain points and not at others. Mr. E. W. Hughes asked as to the pressure in Sheffield, and if the water was supplied for motive power and by meter. The President (Mr. J. Tomlinson) agreed with the remarks of Sir L. Bell, that deterioration in boilers was partial. Mr. C. Cochrane remarked that corrosion was caused by the acidity of the oils used for boilers; and he feared that so-called "pure" water had the credit of this kind of corrosion. Mr. Eaton, in replying to the several remarks, said the discussion on boilers and the application of water for use therein was rather outside the subject of the Sheffield Water-Works. However, he wished to say that there was a boiler in Sheffield which had been 40 years in use, and he was told that it was as good now as when it was first put down, and that it had never been fed with any but the Sheffield water. This, he thought, was sufficient testimony to the quality of the water for boiler purposes. As to the question of pure *versus* impure water, a good deal turned upon the word "pure." The Sheffield water had only 2° of hardness; so that it might be looked upon as being practically a pure water—not perhaps in the sense in which the chemists would use the expression, but certainly in that in which a mechanical engineer would employ it. The action of the water upon wrought-iron pipe was such that this kind of pipe could not be used in Sheffield at all. It was completely closed up inside in three years; and very frequently it was eaten through in that time. Cast iron lasted very well; the only difficulty the Water Department had with cast-iron pipes was the formation of tubercles of oxide of iron, combined with peaty matter, on the inside of the pipe; and the cause of this formation was very obscure. The action of the water on lead pipe had been a very vexed question. Undoubtedly the Sheffield water did act upon lead. The popular interpretation of the action, he thought, might be explained in this way: The water was very pure; it was very hungry, and would eat anything with which it came in contact. If the first subject upon which it could exercise its hunger was the inside of a lead pipe, it was very well satisfied to take up lead; and it did do so. But the Sheffield water was by no means so energetic in its action on lead as the waters in some other places. The Sheffield water was now being treated with chalk in a state of fine subdivision, for the purpose of avoiding this action; and recent experiments upon new lead pipe had shown that the treatment was successful. He would not say that it did not take up a little lead; but certainly there was no serious action. They, however, had not yet reached finality in this. They had been trying the process during a period when the action upon lead was naturally falling to a minimum—that was to say, it dropped from February to July. From July it went on increasing until November; and between that month and February the lead-dissolving power of the water oscillated, but maintained practically a constant quantity. He went on to state that parcels of files and cutlery had from time to time been found in the dams; and the water had acted upon them very considerably. Cast-iron pipes had been found quite corroded through in some parts of Sheffield in from two to three years. The corrosion was from the outside; and it was caused by the ashes that were used so largely in the towns for making the roads. It was due to the formation of sulphuric acid. But there was this curious fact about it, that although the pipes were so soft when in the ground, if they were left exposed for a couple of days to the atmosphere they became hard again. As to the question of the average pressure of water, this must of necessity vary very much in a town having the physical configuration of Sheffield; but they endeavoured to maintain as far as possible a pressure of a column of water equal to 150 to 250 feet head. The pressure varied from 60 feet as a minimum to 400 feet as a maximum. The latter pressure, however, was dangerous and destructive; and no lead pipes or fittings would long stand against it. Water was supplied in Sheffield for motive power direct from the mains, and was measured at the outlet. Both high and low pressure meters were used; but the objection to the former was their liability to damage. He had known 140 broken by frost in one night; while a low-pressure meter would

remain frozen for weeks and be no worse. With regard to the canalization, he explained how the old wooden pipes were laid, and said they were packed with wool. Some of the wool packing had been in use from 60 to 100 years; and it was now as perfect as when put in.

In connection with the meeting, arrangements were made by the Local Committee for the members to visit the water-works. This they did under the guidance of Mr. Eaton. The party went first to the Damflask reservoir, where they examined the wing trench which, as stated by Mr. Eaton in his paper, is being cut through the rocks to prevent leakage. The weather not being very favourable, only a passing glance was cast at the Agden reservoir, and the party passed on to Dale Dyke. There however, they spent two or three hours. Mr. Eaton conducted the visitors to the new reservoir, and down by the side of the overflow to the old dam which burst in 1864. In the marquee on one of the plateaus of the embankment luncheon was served. Among the toasts honoured on the occasion was that of "Prosperity to the Sheffield Water Undertaking," proposed by the President of the Institution. He called attention to the preparations which had been made to provide water for the population of the town, which, since the Institution were last in Sheffield, had increased between 50 and 60 per cent. This he regarded as a very large extension. The works they had seen were of the most substantial character. He coupled with the toast the names of Mr. C. Hawksley and Mr. Eaton. The latter gentleman, in responding, expressed his pleasure at meeting the members, and laying before them a few facts relating to the water-works of Sheffield. It was, he said, a very important undertaking to supply water to a large manufacturing town like theirs, and was not a matter to be lightly entered upon, or to be conducted with any levity of spirit. He hoped the Institution would have learned from their visit something about the way in which the works had been constructed and were now carried on. After luncheon, the weather having cleared up, a visit was paid to the Strines reservoir.

The East London Water Company's Dividend for the half year, January to June last, will be at the same rate as before—7½ per cent. per annum—carrying forward £17,081.

Iron and Steel Institute.—Among the papers to be read at the autumn meeting of this Association (to be held at the Chickering Hall, New York, commencing on the 1st prox.) will be one by Mr. Burdett Loomis, of Hartford, Conn., entitled "Fuel Gas and Some of its Applications."

Bramley District Gas and Water Company.—This Company has been registered with a capital of £10,000 in £10 shares. It has been formed to carry out an agreement to take over the rights of the Guildford Gas Company for supplying Bramley with gas, together with the mains, meters, and services as now laid within the parish. The new Company proposes to erect gas-works, and extend the supply to Wonersh, and to a large Catholic College now being built at Lostiford, about a mile from the village of Wonersh. There being great need of water, the Company also intends to erect water-works for the supply of Bramley and Wonersh. Mr. Sparkes, Assoc. M. Inst. C.E., of Guildford, has been appointed Consulting Engineer, to carry out his scheme for the water supply.

Recent Advances in Photometry.—In their last issue, our contemporary *Nature* notices an ingenious application of the properties of iodide of nitrogen to photometry, as detailed in *La Nature* for the 6th inst. It is pointed out that the photometer invented by M. Lion, is based on the fact that equal surfaces of iodide of nitrogen, preserved under its mother-liquor, and exposed for equal times to lights of equal intensities, evolve equal quantities of nitrogen. Two vessels are connected by a differential manometer; and when the rate of evolution of the nitrogen is the same in each, the manometer is unaffected. It is stated that the iodide of nitrogen, kept in the mother-liquor in which it has been prepared, is perfectly safe to handle. In practice, owing to the difficulty of exactly balancing the two halves of the apparatus, a method analogous to "weighing by substitution" is employed; but the accuracy attainable in the measurements is not stated. In the same number another photometer of considerable theoretical interest is described. It is the invention of MM. Seguy and Verschaffel; and it was described by them on the 1st inst. at the Academie des Sciences, Paris. It is based upon the principle of Crookes's radiometer; but the discs, instead of being free to rotate, are suspended by a silk fibre; and with an indicating needle and divided circle, they form a torsion balance. An alum cell is placed in front of the instrument, which, as a photometer, appears to be very sensitive, indicating 1-100th of a standard candle. Moreover, two instruments can be constructed, which with light of the same intensity give the same readings—an important practical advantage. So long as these instruments are used to compare lights of the same quality, there seems to be no doubt that they can both be made to yield results of practical value, and comparable with each other. It appears doubtful, however, whether the same figure would be obtained with the chemical and with the mechanical photometer, if used to compare the illuminating powers of two sources of light that differed much in character—such as an arc lamp and a candle flame.

REGISTER OF PATENTS.

Liquid Meters.—Jewell, R., of Battersea Park, London. No. 12,905; Aug. 15, 1889. [8d.]

This invention relates to the class of meters for measuring and registering the flow of liquids through conduits, in which a positive measurement is effected by alternately filling and emptying cylinders or chambers of determined capacity.

In the meter there are two or more closed cylinders or chambers capable of vertical reciprocating motion; the cylinders being connected together by a balance lever or sway-beam, so that when the one descends the other rises, and *vice versâ*. Each cylinder is provided at the top with a supply nozzle, connected in such a manner with a fixed supply-pipe as to allow of the above-mentioned free vertical motion. The connection for this purpose may be conveniently made by causing the cylinder nozzle to slide within, or upon, the end of the supply-pipe. Each cylinder is also connected in a similar manner to a discharge-pipe; the two or more supply and discharge pipes being, if required, made as branches of one main supply and discharge pipe. The supply and discharge nozzles are closed by valves pressed down on their seats by springs; the discharge-valves being pressed open, when the cylinders arrive in their lowest position, by one or more rods or fingers projecting up from the discharge-pipe so as to bear against the under surface of the valve.

Each cylinder contains a float which, when the former is filled with liquid, presses upwards a contact piece that closes an electrical circuit in which is included an electro-magnet, whose armature forms a catch to a cam-shaped disc; so that, when the armature is attracted, it frees the disc and allows it to turn. The disc itself is fixed to the beam connecting the two cylinders; so that, while the one cylinder is filling and the other is discharging, the beam is locked in position, while when, on the filling of one cylinder, the float effects the closing of the circuit, the beam is set free, and the filled cylinder now descends by gravity to discharge its contents. This raises the second cylinder, in order to be filled in its turn.

Connecting Wrought-Iron or Steel Pipes or Tubes.—Lloyd, G. H., of Sutton Coldfield. No. 14,259; Sept. 10, 1889. [8d.]

In the types of lead joints at present used to connect together lengths of wrought-iron pipe or tube, the patentee remarks in his specification, the form of the socket resembles that which has been found most convenient for use with cast-iron pipes—that is, the metal forming the socket is shaped to produce a parallel annular space around the end of the pipe which is inserted in it; and packing is first placed, and then lead run into the space to firmly hold the pipes together. This method is well adapted for cast-iron; but in its application to wrought-iron or steel pipes, it has been found inconvenient in several ways. In forming the annular chamber, the wrought iron or steel is necessarily somewhat drawn or strained at the portion where the metal expands from the ordinary diameter of the pipe to the increased diameter required to form the annulus around the inserted end. This tends to weaken the socket at that point; and at the same time a considerable quantity of lead and packing is required to fill in the annulus, so that the expenditure for lead alone is considerable in a long series of lead-jointed pipes.

The object of the present invention is to simplify the manufacture of lead-jointed pipes, and pipes jointed with other packing materials, by constructing the socket so that it is easily and rapidly produced without unduly straining or distressing the metal of the pipe, while at the same time a joint is produced which is able to withstand high pressures with a much smaller quantity of lead than has hitherto been required. This is effected by expanding the end of the pipe in conical form, so that the socket gradually tapers from the greatest diameter to the ordinary diameter of the pipe without a shoulder. A ring is then riveted outside, so as to thicken up and thus strengthen the expanded edge of the pipe; and the heads of one or more rivets are allowed to project into the interior of the conical end so formed. The end of the pipe which is to be inserted is faced and turned or cut on its exterior, in order to make one portion conical. It is then slipped into the expanded conical end of the pipe to which it is to be jointed; and into the conical annulus surrounding it there is forced the yarn or other packing, and after this the lead is run in to complete the joint. The lead flows round the heads of the projecting rivets, and takes a firm hold, so that the pipes cannot be easily forced apart.

Another part of the invention is applicable to pipe connections of a temporary kind, when it is desirable to connect securely, and also to allow rapid disconnecting when required. In this case the conical, or approximately conical, socket is used, and the inserted end is shaped or fitted as before described; but rubber or other compressible packing is substituted for the lead.

Gas-Exhauster.—Saville, G., of Todmorden Gas-Works. No. 15,741; Oct. 8, 1889. [8d.]

The improvements to which this invention relates are principally applicable to double-cylinder reciprocating gas-exhausters or air blowers, and consist of a novel form and arrangement of valve-box, valves, and gas passages.

In this arrangement, a motor is employed—by preference a double-cylinder horizontal steam-engine—the piston rods of which are lengthened, and form also the piston rods of the exhauster, the cylinders of which are fixed on the same centre-line as the steam-cylinders. A stud projecting laterally from the piston-rod crosshead carries one end of a connecting-rod, the other end of which is connected to a crank on the fly-wheel shaft. The valve-chest of the exhauster cylinders occupies a great portion of the space between the two cylinders, and is divided into two parts by a horizontal partition; the two spaces thus formed communicating with the gas inlet and outlet pipes. The ports opening into or out of the cylinders adjoin openings in the horizontal partition in the valve-chest, whereby the valves which have faces formed at, or approximately at, right angles to one another, are capable of opening or closing the cylinder ports, or of forming connection between such ports and the adjoining orifice in the partition for the inlet of gas. These slide-valves of the exhauster are actuated by means

of eccentrics mounted upon the main or fly-wheel shaft. One or both of the two compartments of the valve-chest may be enlarged at the ends of the chest to the full size of the gas inlet and outlet pipes, so as to facilitate the free passage of the stream of gas.

Fig. 1.

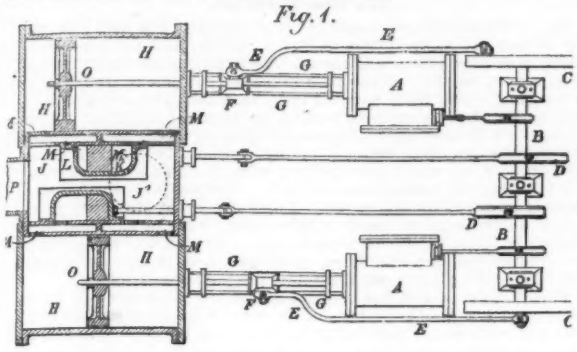


Fig. 2.

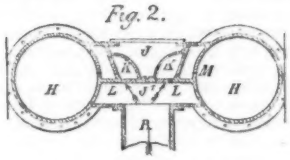


Fig. 3.

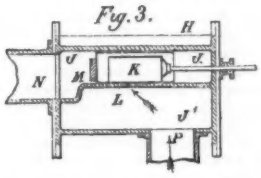


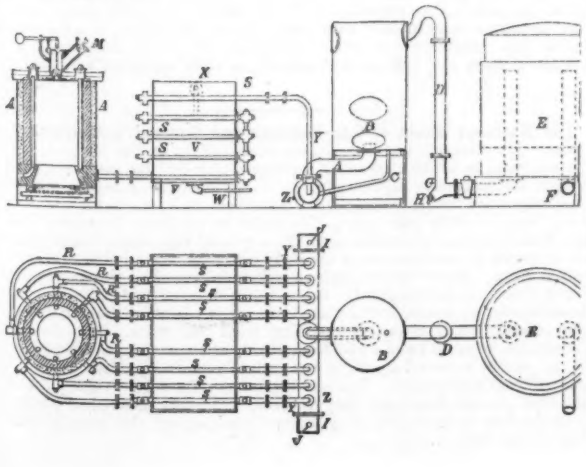
Fig. 1 represents a plan of the exhauster combined with a horizontal steam-engine; the valve-chest of the exhauster and the gas-exhausting cylinders being shown in section. Fig. 2 is a transverse sectional elevation of the gas-exhausting cylinders and valve-chest. Fig. 3 is a longitudinal sectional elevation of the valve-chest.

The steam cylinders, by which the exhauster is actuated, are shown at A; the main driving-shaft, at B; and the balanced disc cranks, at C. These cranks receive motion from the connecting-rods E, coupled to the piston rod crossheads F, which are mounted upon slide blocks moving on the slide-bars G. The exhauster cylinders are represented at H; the pistons thereof, at O; the gas valve-chest, at J and J^1; and the slide-valves, at K. L are the openings or gas passages from the lower to the upper compartment of the valve-chest; and M, the gas ports for the admission or emission of gas into or out of the exhauster cylinders. P is the inlet-pipe for the supply of gas to the exhauster; and N, the outlet-pipe.

The pistons of the exhauster being put in motion, a partial vacuum is formed in the exhauster cylinders, to supply which vacuum a flow of gas immediately takes place through the inlet-pipe P into the lower compartment of the valve-chest J^1. The gas then passes up through the orifice L into the valve K, operating in the upper (or outlet) compartment J, and thence through one of the gas ports M into the cylinder H. On the return stroke of the piston, the indrawn gas is forced out of the cylinder (through the port by which it entered) into the valve-chest J; the slide-valve K being withdrawn by the motion of the eccentric, and thereby leaving the gas port uncovered. From the cylinder port and valve-chest, the exhausted gas passes to the outlet-pipe N, to the scrubber, or wherever else it is required.

Manufacture of Water Gas applicable for Gas-Engines, &c.—Paisley, J. R., of Colnbrook. No. 15,797; Oct. 8, 1889. [8d.]

The object of this invention is to produce gas by the action of steam and air upon incandescent fuel—in the words of the patentee, "of a more uniform quality than at present obtained with Dowson's or other similar apparatus."



The illustration represents an elevation and plan of apparatus (partly in section) constructed according to the invention.

A is the producer, the space between the firebrick lining of the body of which is filled with sand or other non-conducting material. Each of the gas-exit tubes R from the producer is connected to a coil F formed of wrought-iron or other tubes connected together, and provided with plugs to enable the tubes to be cleaned. Each coil passes through a tank V containing water. W is the inlet-pipe for water to the tank; X, the overflow-pipe for same; and Y, the pipes from the coil to the hydraulic main Z. A is the gas-main from the hydraulic main to the scrubber B; and C, the water supply from the scrubber to the main Z. D is a gas-pipe from the scrubber B to a gasholder E. F is the outlet main from the holder to the engine or other apparatus; and G the drain-pipe, fitted with a cock H to run off tar and other bye-products. The hydraulic main has at either end an open box I, fitted with an overflow-pipe J, to maintain the water in the main at a constant level; the gas in the main being prevented from entering the boxes by means of a trap. The pipe A terminates some distance above the bottom of the scrubber B, to prevent the water which is introduced into it through pipes fitted with roses, and accumulating in the bottom of the scrubber, from passing down the pipe.

When the gas is used for heating purposes, the cooling apparatus may be dispensed with, and the gas taken direct from the producer through a descending pipe to the furnace of the boiler; a testing-pipe being fitted to it. The principal pipe is made to gradually descend, or a suitable trap or syphon may be attached thereto, to catch any tar or other liquid condensed in the pipe, and which liquid may be drained off by suitable cocks or other apparatus. In this producer the vertical pipes in the apparatus are dispensed with; and a cylinder of firebrick or other material (luted to the blocks, or otherwise made gas-tight at the bottom) is employed in their place. When fresh fuel has to be introduced into the producer, the ball-valve M is removed, and the hopper filled with fuel. On the lever shown being actuated, the fuel will fall by gravity into the producer, and the feeding orifice closes.

Water and other Pipes and Conduits.—Robbins, J., of Uxbridge Road, London. No. 5405; April 9, 1890. [8d.]

This invention consists in providing lengths of pipe and other conduits with saddles or bearers, whereby the lengths may be connected in such a manner as to ensure their occupying the proper positions in relation to each other, independent of any special care on the part of the workmen engaged in laying or fixing them. In the case of longitudinal or inclined lengths, this will enable a true line to be preserved in the lower part, or allow a slight drop to be produced at the end of each length in the direction of the flow of the liquid to be conveyed; while, in the case of vertical pipes, the saddles or bearers ensure the lengths being connected in a true line. Further, the means employed for such purposes may be so arranged as to cause the different lengths when connected to interlock, whereby they will be maintained in any desired position until the joints between the lengths are made; thus enabling the making of such joints to be deferred until a number of lengths have been connected, instead of having to make each joint at the time each length is laid or placed in position.

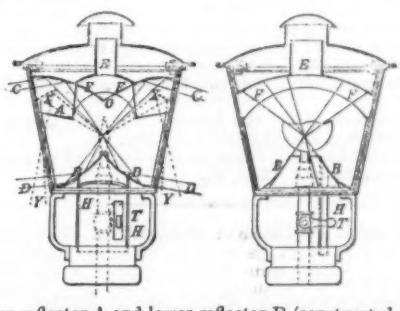
Water-Waste Preventing Valve.—Goodson, H., of Berlin. No. 8428; May 31, 1890. [8d.]

This invention relates to the construction of a water-waste preventing valve or tap, in which a second or auxiliary free-moving valve is applied in connection with the stop-valve operated by hand, so that, when a predetermined quantity of water has been allowed to flow from the tap or valve, the auxiliary valve will shut off the supply, even when the main valve remains open, in order to prevent loss of water through wilful neglect or carelessness.

Reflecting Arrangements of Street and other Lamps.—Leak, H., of Winsford. No. 9227; June 14, 1890. [8d.]

This invention relates (so far as gas-lamps are concerned) to a combination of upper and lower distance reflectors, to the employment of "improved" corner bars or uprights, and to apparatus for facilitating the lighting of the lamps.

The illustration shows sectional views of the lamp taken at right angles to each other.



The upper reflector A and lower reflector B (constructed of polished sheet metal, earthenware, glass, or other suitable material) are so formed and adjusted as to receive and reflect as many of the rays of light as possible—say, to about midway between two street-lamps; the dotted lines C D representing the rays of light falling at the required distance from the distance reflectors up and down the street in opposite directions. In the case of street-lamps in which a gas-flame is used, the upper distance reflectors are cut off a short way from the chimney flue E, where they intersect with an arched reflector F, serving to reflect the light falling on them down on to the lower distance reflectors B on the opposite side; whilst the other rays are reflected down and serve to light the space beneath the lamp. In the case of an electric light being used as the illuminating agent (no chimney flue being necessary), the upper distance reflectors meet together in the

centre, as indicated by the dotted lines G in fig. 1, whilst the outer portion of the arched reflector F is left intact. In the case of corner street-lamps, where the light is required to be thrown in four directions up and down the main and side streets, the interior arrangements of the lamp would be modified by having double sets of upper and lower distance reflectors; the bottom reflectors being cut away at the corners so as to permit the light to pass through windows to light the space beneath the lamp; whilst corner reflectors are used at the top to throw the light downwards. If these corner reflectors are dispensed with, a downward reflector going all round may be used (as indicated by the thick dotted lines X in fig. 1); and in this manner the light is thrown to the floor, as indicated by the dotted lines Y, whilst the light to and from the upper reflector A passes over this downward reflector. In this case the upper distance reflector is continued all round, and is more or less of annular or radial construction.

The illustration also shows a metallic bracket or guide-plate H fixed to the bottom of the lantern, with a slot formed in its face, through which the end of the lever T of the gas-tap projects. This bracket serves to guide the staff of the lamp-lighter in first turning on the tap, and then opening the lighting window J to ignite the burner; whilst it equally serves as a guide for his staff in turning off the tap. If the lamp is lighted (as in some cases) through a hanging side-window, counterbalanced by a weighted lever, a similar guide bracket might be used to direct the lamp-lighter's staff first against the counterbalancing lever, first turning on the gas and next opening the window.

The invention also embraces improvements in the corner bars or uprights which support the edges of the glass in street and other similar lamps. These consist in making the bars of such cross sections as to obtain great strength and rigidity without unduly interfering with the light; the inner surfaces of the bars being enamelled or otherwise utilized as reflecting surfaces.

APPLICATIONS FOR LETTERS PATENT.

13,714.—ANDRE, E., "Improvements in gas or fluid compressors or condensers." Sept. 1.

13,737.—WASHINGTON, S., "Improved means for connecting lead pipes or for affixing taps or the like or other pipes to same." Sept. 1.

13,798.—SUHR, H., "Improvements in street and other gas-lamps." Sept. 2.

13,829.—DANKS, E. J. B., and FLETCHER, W. F., "Improvements in gas-pressure governors." Sept. 3.

13,846.—GUNN, A., "Utilizing ordinary gas brackets, pendants, or any other gas-fittings for boiling, cooking, &c." Sept. 3.

13,883.—SWEET, A., "Improvements in 'metal fuel' for gas-fires." Sept. 4.

13,961.—FOURNESS, H., "Improvements in gas-lighting appliances." Sept. 5.

13,991.—HADFIELD, F. J., "Improved means for connecting screwed pipes and screwed nipples." Sept. 5.

14,052.—ARMOUR, L. H., "Improvements in means employed in the manufacture of hard coke, the distilling of shale, the washing of ores or other operations wherein carbonaceous matter is subjected to the action of heat." Sept. 6.

14,122.—JARRARD, E. P., "Improvements in or pertaining to lighting." Sept. 9.

14,125.—FRANKLIN, C. A., "The utilization of waste heat from the exhaust of gas-engines." Sept. 9.

14,126.—EADIE, A., and TANNAHILL, J., "Improvements in or connected with joints or connections for pipes or tubes." Sept. 9.

14,253.—JONES, A. O., and FOX, S., "Improvements in the treatment of sewage." Sept. 10.

14,254.—JONES, A. O., "Improvements in the treatment of sewage and in apparatus therefor." Sept. 10.

14,265.—PRIDHAM, T., "An improvement in the construction of tanks or reservoirs." Sept. 10.

14,284.—LAIDLAW, R., and SHARP, J., "Improvements in and relating to rotary blowers or fluid forcing or pumping apparatus." Sept. 10.

14,297.—WEBB, G., "Improvements in carburettors." Sept. 11.

14,298.—WEBB, G., "A new or improved process, and apparatus for supplying gas-lighting in a portable form to railway, omnibus, and other vehicles, and for other purposes." Sept. 11.

14,320.—PEEBLES, D. B., "Improvements in apparatus for governing and measuring, or recording the flow of illuminating gas." Sept. 11.

14,381.—LANCHESTER, F. W., "Improvements in the governing arrangements of gas and other motive-power engines." Sept. 12.

14,382.—HALL, H. P., "Improvements in igniting arrangements for gas or oil motor engines." Sept. 12.

14,397.—MANN, E. B., "Improved coupling or joint for pipes." Sept. 12.

14,422.—TRUEMAN, H. P., and BRISCOE, W. H., "Improvements in the construction of gas heating stoves." Sept. 13.

14,454.—MACKEAN, W., "Improvements connected with mantels for incandescent gas lighting." Sept. 13.

A Water Famine Predicted in Lincolnshire.—Alderman Fowler, of Louth, who is regarded as an authority on the subject, predicts a water famine in Lincolnshire in the course of a few years. The springs and streams are drying up; and he declares the outlook to be ominous in regard to the water supply of the county.

Brisbane (Queensland) Gas Company.—From the report of this Company just to hand, giving the results of the half-year's working to June 30 last, we learn that the amount standing to the credit of the profit and loss account was £11,244, out of which the Directors recommended a dividend of 6 per cent., absorbing £8394, and leaving a balance of undivided profits to be carried forward of £2850. It is reported that the Hamilton and Rosalie extensions have been completed, though the wet weather has caused considerable delay; and that other extensions will be proceeded with as soon as possible. In the course of their report, the Directors recommend that application should be made to Parliament for a Bill, enabling the Company to supply electric and other kinds of lighting, and hydraulic or other motive power.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

The New Unionism.

SIR,—I have read your leader in the JOURNAL of the 16th inst., and beg of you not to treat Messrs. Burns, Tillett, and Co. too lightly. These men have power and energy, with fighting force similar to that of a British bulldog. They have education sufficient to enable them to read and write; but I question very much their knowledge of book-keeping, or their practice of posting up accurate accounts. In any contractor's or merchant's business, employing large bodies of men, and turning over large sums of money, there are timekeepers, clerks, book-keepers, and a well-arranged pay-table, to which each man comes and takes his pay, neither more nor less. The pay-table of Mr. Burns appears to have been his pocket. I do not say that Mr. Burns is not honest as the steel he ought to be working; but I do say that, being honest, he must have had anxious days and sleepless nights under his tremendous responsibilities, in dealing with multitudes of poor, idle men, and having to pay them from heaps of untold gold.

That Mr. Burns and his co-partners are not wise men I do know. They can know little or nothing of history—of the ultimate fate of all past mob societies, or they would pause in their career. There is no doubt something grand, imposing, and spirit-stirring in calling out and reviewing tens of thousands of men, marching to music, and flaunting silken banners bearing revolutionary mottoes. Then to address such mobs from a platform, and have Socialistic platitudes cheered to the very echo, and the names of those they dislike reviled. After such meetings, blatant windbags may probably go home and sleep soundly. But the leaders, who know most, will be gratified least. I who write this have been personally acquainted with Trades Unionism for 58 years; and I do know that in 1832 there were leaders then who would, if they could, have been bullies, and some of them turned out to be arrant rogues. Masters then were to submit their contracts to inspection, that wages should be assured. There was to be no piece-work, no apprentices other than sanctioned, and all men must draw equal wages; and any man offending would be turned out of the Union, and be prevented from ever again working at his trade. I knew good men who, under this tyranny, died broken-hearted; and I also knew of murder committed. During this strike, delegates were chartered to traverse the country and make collections; and I knew of my own knowledge that before the strike some of these men had nothing, but afterwards they never did any work at their trade, but managed to live in idleness.

We have epidemics of disease, and it appears that we can have an epidemic of strikes; as, since trade has revived, they have been rife throughout the civilized world. I have, in my long life, seen several trade depressions with intervening periods of what is termed trade prosperity; and I am sorry to have to confess that I have never yet known a time of great prosperity when working men did not lose their heads, and indulge in tomfool fads and dissipation. I remember hod-carriers insisting on being conveyed to their work in the country by some sort of conveyance. Reckless living was also indulged in; there was no proper thought; no feeling of responsibility; no true care; and no saving. Men could, in past prosperous times, and now can, earn in three or four days, with their high wages, as much as they had earned in six days with their ordinary wages; and so now three or four days only will they work. See how this conduct operates on capital. From 1878-9 to 1889 trade was slack, and wages were low, but at the same time above what selling prices warranted; and, in the coal and iron trades, capitalists worked at a loss. They, however, paid the men current wages to keep their works together. Trade has revived, wages have been increased 50 and 60 per cent.; and the result is, as of aforetime, the men will not work more than four or five days out of the six, and in eight-hour shifts. The strike leaders are rejoicing at these changes, and blindly and exultantly cry out "*Eureka!*" taking no thought of the inevitable change to bad trade again.

These Trade Union upheavals require a little more attention from the State than they get. In London a firm Home Secretary is wanted; and the police need to be properly organized and handled. In a free country there should be all-round freedom. Let mobs assemble, so long as they are orderly and do not injuriously inconvenience those who do not combine to form a mob. Let Trades Unions combine and limit their hours for labour, and obtain the highest wages practicable. But (and this is the knot of the whole case) outside of your Union, hands off. Dictate your hours of work, and dictate the wages to be paid to Union men, and maintain your arbitrary rules to the uttermost; but no coercion. Those who employ and pay men should be enabled to employ and pay other than Union men, without the possibility of let or hindrance; no persecution by unionists; no violent picketing; and no direct interference with men who do not belong to a Union. Trade and commerce will then be enabled to govern in equity, and Trades Unions can rule as despotically as their members will bear.

Sept. 17, 1890. X.Y.Z.

The National Union of Gas-Workers and General Labourers.

SIR,—My attention has been drawn to an article in the JOURNAL of the 2nd inst., in which you make a direct attack on the leaders of all Unions lately sprung into existence. I, for one, never expect much sympathy from the JOURNAL; but I do expect at least what is due to every man—a little fair play. You refer to my letter in answer to Mr. Frank Livesey some time ago. Every word that letter contains I am prepared to prove to you or anybody who takes the trouble to come to this office. An Editor of such an influential paper as the JOURNAL ought at least to be impartial. When I said that we paid strike pay to those men for 17 weeks, I said what I can prove; because the strike pay went direct every Saturday morning from this office. The Strike Committee, who sat in the Old Kent Road, had not the paying of it; all the money received by them was grants sent in by other Unions, and public subscriptions. You seem to convey the idea to the public that that was all the money they received. The men themselves ought to be the best judges; and they know they received the money, and they do not deny it.

With respect to the men sent to the Ponders End works of the Enfield Gas Company, they were sent there by Mr. Livesey, under false pretences, as service layers. Four of them did not belong to the Union, but two did belong to it; and as soon as they were asked to go inside in the retort-house they refused, and would you be surprised that we are now paying these two men? I think you ought to enquire more carefully into matters of this sort before you rush into print and try to throw dust in the eyes of your readers.

I may tell you that scores of stokers gave over buying the JOURNAL on account of you refusing to insert my last letter, in which I challenged Mr. West to meet me in Manchester, where I went prepared to prove to him by the books at the Rochdale Road Gas-Works that he reduced the yardmen's wages at that station by 2s. per week. Well I suppose you deemed it prudent and wise on your part not to afford me that opportunity. So much for your sense of fair play. In all your articles, you try to ridicule Mr. Thorne and me; but I would remind you that, though brought up all our lives as genuine hard-working men (I have worked six years in the mines, and am one of the survivors of the Oaks Colliery explosion of the 12th of December, 1866, and ever since I have been a stoker), we both consider ourselves as truthful and as honest as you, Sir, George Livesey, or John West.

W. H. WARD, Assistant-Secretary,
Gas Workers' Union.

144, *Barking Road, E., Sept.* 15, 1890.

[This letter is mentioned in our Editorial columns to-day.—Ed. J.G.L.]

A Review of a Criticism.

SIR,—Notwithstanding the venomous spirit—I might almost say spite—betrayed in Mr. Gadd's "Review," I am pleased that he has at last made an attempt to substantiate his views; and I will therefore take an early opportunity of replying to the same and exposing the fallacious reasoning employed therein. I must, however, ask the indulgence of your readers for a fortnight or so, as I cannot well turn my attention to the matter just at present.

F. S. CRIPPS.

Sutton, Sept. 17, 1890.

Mr. Gadd's Gas Institute Paper and Mr. Cripps's Criticism.

SIR,—In reply to Mr. W. Lawrence Gadd, I will state that the extracts he makes from my criticism and from the letter by a "Gas Engineer" do not contradict one another in the slightest. It is one and the same idea expressed in two different ways. If in the extract from my paper the *comma* after "axis" be omitted, he will see at once that this is so. I may mention that this comma should not have been inserted, as it does not occur in my original manuscript sent to the printers. Apart from this explanation, the context in my criticism and subsequent correspondence clearly indicates the true meaning of the passage.

F. S. CRIPPS.

Sutton, Sept. 17, 1890.

SIR,—Mr. W. Gadd's letter needs no reply. It is no part of my business to teach him elementary mechanics. Indeed, if I gave him the proofs he appears to be in want of, it is doubtful whether he would understand them. His mind seems to be utterly confused on the subject of mechanics. To refer to Rankine as an authority for the absurd misrepresentations of mechanical principles set forth in his last article, is a libel on the great man's name. Nowhere in Rankine's works can the absurdities set forth in Mr. Gadd's paper be found or justified.

Mr. Lawrence Gadd's letter, however, needs a reply. If he will refer to the context of the passage he quotes from Mr. Cripps's paper, he will see at once the true construction to be put upon the words. I may state that the quotation Mr. Lawrence Gadd gives from my own letter is entirely in accord with the passage from Mr. Cripps's paper, and not in the slightest degree antagonistic to it.

GAS ENGINEER.

Sept. 19, 1890.

The Bradford Corporation Electricity Department.

SIR,—Permit me to offer in your columns a few observations upon the report of the above-mentioned department, which appeared in your last number. The result of the experiment in electric lighting at Bradford cannot fail to be instructive to "all sorts and conditions of men," because, in the first place, the Bradford Corporation is recognized as a body of shrewd practical men, and, secondly, because the experiment was carried out on a large scale under peculiarly favourable conditions. The result of about twelve months' working is shown in the report of the last Town Council meeting. There has been a loss of £1000 on the year's working; and the Chairman of the Gas Committee (Mr. Alderman Priestman) stated that if a sum of about £10,000 were appropriated from the gas profits, and applied to the electric lighting works, it might put vitality into them. This is not a brilliant success. It is not even a decent failure; it is a beggarly failure.

It may be stated, I know, that the price charged was too low, or the system of electric lighting selected was not the best, or that the district was unfavourable, or that the people did not choose to have electric light. Now none of these reasons will answer. In the first place, as to price. It was 5d. per unit—low, I admit, for electricity; but equivalent to 4s. 2d. per 1000 cubic feet for gas. Now as to the system of light employed. It was the continuous current system; and it is claimed by electricians that this system is extremely economical, but practicable only in small areas of distribution. The area chosen at Bradford was compact and central; and only about £25,000 was in the first instance expended on the erection of three 150-horse power engines, with three sets of steam dynamos, and all other fittings and appliances. I do not think it can be argued that any other system is cheaper. I will ask your readers to note the plan which is described, and to remember that this plan was for the supply of 5000 16-candle incandescent lights.

I will now take a totally different system—the alternating current system. This system claims economy in first cost—of cables especially, with great adaptability to large zones of distribution. It is applied at Bath for 4000 incandescent, and 200 arc lamps. There are four 35-horse power engines for working the arc lights, and two 150-horse power engines for the glow lights; and the total cost of this installation is stated as about £25,000. I cannot see therefore that any charge can be brought against the Bradford Corporation on the ground of want of economy.

The growth of consumption of electricity for lighting was so great at Bradford, that last January the Electric Supply Committee of the Corporation sought authority for the expenditure of an additional sum of £10,000—which shows that they had increased in consumption; and yet the result is that given above. There are only two ways out of the difficulty, Mr. Alderman Priestman says. Either the gas must provide the funds for working electricity, or the price of electricity must be increased.

In consequence, therefore, of the large scale on which it has been tried; in consequence of the favourable circumstances surrounding it; in consequence of the great ability of the Committee of the Bradford Corporation, who have worked it—the lessons to be derived are interesting to all those who have any connection with the question of public lighting in any degree whatsoever. Why is a gentleman of admitted foresight and prudence placed in the position in which Mr. Alderman Priestman finds himself? Is it not because the Legislature has created a false position, and made it incumbent upon corporations, whether they will or not, to go in for electric lighting? The matter is simply this: Two or three electric lighting companies pounce down upon a municipality; and in order to keep them out, the corporation can do nothing else than apply for a Provisional Order themselves. But it does not end there; they must be prepared to put the Order into practical force, or their powers lapse very quickly. Now I ask: Is not this action of the Legislature worse than the systems of Protection and Bounties? There is one consolation, however, although a corporation may be harassed, although the ratepayers may be plundered by Act of Parliament, it would seem that electric lighting, even when adopted, does no harm to gas. I notice that the sales of gas have increased about 6 per cent. at Bradford, notwithstanding the adoption of electricity.

THOMAS CANNING.

Newport (Mon.) Gas-Works, Sept. 19, 1890.

Examinations in Gas Manufacture.

SIR,—In most of the sciences and arts, classes are held for the advantage and benefit of students. Why we never have a class in "Gas Manufacture," is a matter of very great surprise and regret to me. If such a class could be formed in Manchester (say) on Saturday afternoons, I feel sure there would be plenty of students forthcoming. Then with an able teacher, and with the benefits that accrue from the mutual exchange of ideas between one and another, when the examination takes place I think they would be able to pass with more credit, both to themselves and to the profession they represent.

I hope some one with the necessary ability will take the matter up.

"ONE WHO WOULD LIKE TO ATTEND."

Sept. 19, 1890.

P.S.—Failing a class, why not form a Manchester and District Junior Association, similar to the one at London?

Twisted Cast Iron.

SIR,—With reference to the paragraph on this subject in your last issue, there is nothing either "unusual or unprecedented" in the tests mentioned. The iron used in all our heating burners will stand at least any of the tests mentioned, if cast in the same form as the lengths made for the experiments. Soft castings are not desirable for all purposes. If large plates are made soft enough to stand hammering cold, they are very liable to be out of shape; and for this reason we do not use this mixture for large surfaces which have to come together without costly fitting. But when required, cast iron can be made as hard as glass, or soft enough to stand a certain amount of hammering and bending either cold or hot.

THOS. FLETCHER AND CO.

Warrington, Sept. 19, 1890.

The Water Supply of Fulstone.—Last Wednesday, Mr. Arnold Taylor, one of the Local Government Board Inspectors, held an inquiry at New Mill, near Holmfirth, relative to the application of the Fulstone Local Board for sanction to borrow £2000 for the purpose of constructing a storeage reservoir, laying mains, &c., necessary for a public water supply for domestic purposes. Evidence was given showing the pressing need in the district for a proper supply.

Threatening Employees of the South Metropolitan Gas Company.—At the Lambeth Police Court last Tuesday, Michael Levy, a gas stoker, stated to belong to the Fulham branch of the Gas Workers' Union, appeared in answer to summonses for using violent threats towards Christopher Convey, a gatekeeper at the Vauxhall works of the South Metropolitan Gas Company, and towards John Golding, employed in the works as foreman fitter. Mr. W. Washington appeared to prosecute for the Company; and he stated that the defendant, during the late strike of stokers, was one of the delegates of the Union at Fulham, and had acted in such a threatening manner towards the complainants that he should ask the Magistrate to make him find bail to keep the peace. Convey, the first complainant, stated that the defendant came to the gate and wanted to see the Engineer (Mr. C. C. Carpenter). He told him he was not there, upon which he used most violent and threatening language towards him. Witness, according to instructions, went for the police. Prior to this seven or eight men had forced their way into the works, and wanted to see Mr. Carpenter. In the case of Golding, the defendant followed him from the works, challenged him to fight, and when he refused said, "All right; I'll put your light out before winter." Mr. Biron said every effort would be made to put down this sort of conduct. With regard to the first summons, the defendant would have to find bail in £10 to keep the peace for six months, or go to prison for 14 days; and for the second offence, £20 for six months, or a further term of 21 days. The defendant, failing to produce the bail, was removed in custody.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Friday, Sept. 19.

(*Before Mr. Justice* VAUGHAN WILLIAMS, *sitting as Vacation Judge.*)

Faulkes v. Samson Fox—The Water Gas Experiment at Harrogate.

This was an application to restrain the defendant from working an engine, boiler, or machinery, for the manufacture of water gas recently erected in Montpelier Gardens, Harrogate, near the plaintiff's shop and dairy in Parliament Street, in such a manner as to cause a nuisance to the plaintiff or injury to his business.

Mr. MARTEN, Q.C., and Mr. BRABANT appeared for the plaintiff; Mr. SEWARD BRYCE, Q.C., and Mr. WHINNEY, for the defendant.

Mr. MARTEN said he had to ask for an injunction to restrain, until the trial of the case, Mr. Samson Fox from using an engine and other machinery in the production of water gas at Harrogate, so as to be a nuisance and cause damage to the dairy produce kept and sold by the plaintiff in his shop. The machinery began to work on Aug. 5, and plaintiff complained of the heat from the boiler, the noxious vapours, and the offensive smells and fumes. The boiler was only 3 feet from the plaintiff's shop; and it led to the melting of the butter, and the cream and milk becoming quickly unusable.

Mr. SEWARD BRYCE, for the defendant, said he was most anxious not to annoy the plaintiff. There were about 60 affidavits filed in the case; some testifying to a nuisance arising from the works, and others saying there was nothing of the kind. Without prejudice, he would offer to coat the boiler with a material to keep in the heat; to erect something between it and the wall to prevent the heat affecting the plaintiff's premises; and if fumes escaped—of which defendant said there were none—to take steps to prevent it.

Mr. MARTEN said that plaintiff had an open space until defendant put up his gas-works; and he could only consent to an undertaking in the terms of the notice of motion, because, they said, in the peculiar nature of the plaintiff's trade, the proposed schemes could not be effective and remedy what he complained of. There had already been time to provide a remedy had it been possible.

Mr. BRYCE urged that the works had cost a good deal of money. Mr. Fox was as much interested in conducting the experiment free from nuisance as anybody, as he was proceeding under licence from the Corporation, and hoped to get water gas used in the town; and as he was anxious to meet all the reasonable requirements of the plaintiff he submitted his Lordship should hold it as sufficient.

His LORDSHIP, having read the affidavits, said they certainly were very conflicting. He did not think the plaintiff had made out a case for his interference on urgency, and said the matter would stand over until the second motion day in the next sittings.

MISCELLANEOUS NEWS.

VALUATION APPEAL COURTS IN SCOTLAND.

The annual sittings of the Valuation Appeal Courts in Scotland have recently been held; and we give to-day some of the results, so far as gas and water works appeals are concerned.

Last Thursday week the Commissioners for the Upper Ward of Renfrewshire sat in Paisley to hear a number of appeals, two of which were from gas companies. Mr. Beckett, solicitor, on behalf of the Barrhead Gas Company, appealed against the works being assessed on a valuation of £809; and he argued that, from the gross revenue and profits made, the valuation should be restricted to £700. He explained that £774 was the valuation of the works in the parish of Neilston, in addition to which there was a valuation of £35 in another portion situated in the Abbey Parish. Mr. George Davis, Assessor, of Paisley, replied at some length to the arguments of Mr. Beckett; and maintained that he had gone on a safe and sound principle in valuing the works. He also pointed out that the expenditure on the works last year was £2781, and stated that there was a good revenue from the gas made. The appeal was dismissed. At a later stage of the proceedings, an appeal from the Pollokshaws Gas Company was heard. The Law Agent who appeared in support of the appeal objected to the Assessor placing a valuation of £634 on their works; and in claiming that it should be reduced, he maintained that a fair valuation would be £350. Mr. Davis objected to the reduction asked; and the case was argued at some length between him and the Company's Agent, with regard to the productive power of the works, cost of plant, expenditure, revenue, &c. It was urged by the Agent that the valuation had been increased this year, in face of the fact that the profits were less than those of the preceding year; and in reply to that argument, Mr. Davis stated that last year the valuation should have been £692. As in the Barrhead case, the appeal was dismissed. At the Dumbartonshire Appeal Court, held on Friday week, there was an appeal from the Helensburgh Water Company against the valuation of their works being raised from £800 to £1000. Mr. M'Lachlan, Law Clerk, appeared in support of the appeal, and stated that last year the Assessor had raised the valuation from £700 to £1000; but subsequently entered it at £800, and there was no change. He pointed out that the valuation at Helensburgh was the same as that at Dumbarton, whereas the cost of the works in the two places, was, respectively, £8000 and £26,000. Mr. M'Kenzie, solicitor, of Glasgow, appeared and made formal complaint, on behalf of the ratepayers, under section 13 of the Valuation Act, of the manner in which the water-works were assessed. In support of his contention, he stated that the Court of Session had given frequent decisions as to the method for ascertaining valuation. It transpired that the complaint was made at the instance of the Finance Committee of the County Council, in order to bring about a more uniform rate. He asked for a diet to hear evidence in the matter; and after some discussion, it was agreed to cite the various owners to appear before the Commissioners on Sept. 23, and to produce their balance-sheets—the Helensburgh appeal being continued till that date.

Our Edinburgh Correspondent, writing on the subject of the cases, says: The annual Valuation Courts have just been held in Scotland; and I have looked carefully at the reports of them, in the expectation that the ruling of Lords Trayner and Wellwood in the Kinross and Pollokshields cases (see JOURNAL for March 18, pp. 509, 510) would be productive of some business in these Courts. Their lordships' decision in those cases was that the valuation of gas and water works was to be arrived at by taking the amount of net profit and deducting a percentage for tenants' profits. Many works were valued upon the other method, of taking the cost of construction and allowing a deduction for depreciation. Only one case has, so far as I have been able to discover, arisen in district, in which the new method is disputed. This is at Forfar, where, owing to the change, the valuation has been raised by the Burgh Assessor from £782 to £1543. Against the decision of the Assessor, the Gas Corporation appealed; and last Wednesday week Mr. Craik, the Gas Manager, was heard in support of the appeal. He pointed out that the great rise which was proposed—amounting to £761—would increase the rates paid by the Corporation from £160 to £312, equal to an increase of 2d. per 1000 cubic feet upon the output of the gas-works. Mr. Craik's further remarks put the whole question in a new light, and one which is worthy of the fullest consideration. He directed the attention of the Magistrates to a limited liability company which carries on business in the town, and turns over in one week as much as the Gas Corporation does in a year; but whose property is only valued at £80. Mr. Craik, I think unfortunately, asked that consideration of the appeal should be delayed in order that the Gas Corporation might confer with the Assessor and settle the matter with him; and the Magistrates granted the delay. There was surely stronger ground to proceed with the appeal, which would necessarily have required to be brought to the Court of Session for settlement. Mr. Craik's argument was never presented to their Lordships in the Court of Session; and it is difficult to see how they could get over it. The principle they laid down enables the Assessor to value the undertaking at its market value; but that is not the function of an Assessor. He is to value the property, not the business carried on in it. A banking company, for instance, conducts a business which is quite as much a public business as is that of a gas company; yet the Scotch banks would stand aghast at a proposal to value their "undertaking" upon their profits, instead of merely fixing the value of the premises in which they carry on their business. It is true that the business of a bank depends to a great extent upon the wisdom with which it is conducted; but so does that of a gas company. The difficulty in the case of a gas company is in the fact that its property cannot be let for any other purpose than that for which it is built, whereas almost any other description of property can; so that the necessity for a special mode of valuation for gas and water works is apparent. But according to the principle laid down by Lords Trayner and Wellwood, the valuation of these works resolves itself into a tax upon brains, which was not contemplated by the statute. It is evident that their Lordships' decision requires revision, either by themselves or by the Legislature; and the Forfar appeal would give a very good opportunity for having that revision effected.

THE LEEDS CORPORATION GAS COMMITTEE AND THEIR WORKMEN.

The Cost of the Recent Strike—The Holidays Question.

At a Meeting of the Leeds Corporation Gas Committee last Thursday, the cost to the borough of the recent dispute with the men was one of the subjects under consideration. It was stated that, as far as could be ascertained from the accounts and claims sent in, the total cost to the Gas Committee was about £2356. This, it was explained, was independent of the cost of the police and military, which would come under the cognizance of the Watch Committee, and would probably amount to £480. The larger item mentioned covers the cost of taking new men to the town, feeding them, conveying them away, compensation for injuries, non-fulfilment of contract, &c. At the same meeting the difficulty as to holidays arising out of the agreement made between the Committee and their workmen when the dispute was settled, was also dealt with. There had, it appears, been some misunderstanding as to whether the four holidays in the year were to be granted to the whole of the men in the gas-works, or only to the more important sections of them. The matter was recently brought before the Committee, and referred to the gentlemen who acted as Arbitrators in the dispute—Mr. W. Beckworth and Col. T. W. Harding. At Thursday's sitting, the Committee decided that the four days' holiday in the year should extend to all the men in the works; and that Christmas Day, Good Friday, Whit Monday, and August Bank Holiday be considered holidays in the works, on the understanding that the men who were required to work on these four days were to receive double pay. With the satisfactory settlement of this point, the questions of dispute between the parties are considered at an end. On the following day, the Watch Committee had a long discussion with regard to the cost of the strike, in so far as they were specially concerned. It appeared that the aggregate amount of the bills was £474 12s. 4d.; but after going into them with considerable care, the Committee found they were not in a position to pay them without further inquiry.

The Lighting of Swansea by Electricity.—The Borough Surveyor of Swansea has been visiting several towns where there are installations of electric lighting, and has presented a report on his inquiries. It is stated that contracts from certain electric lighting companies have been received, and one is recommended for acceptance. The amount is said to be nearly £200 more than that paid for gas; but "thirteen times the power of illumination will be received." At first it is proposed to light only the centre of the town; and on the success which attends this experiment will depend whether or not the system will be generally adopted.

THE METROPOLITAN RAILWAY FIRE AND THE GASLIGHT AND COKE COMPANY'S MAINS.

The fire on the Metropolitan Railway last Monday may certainly (says the *Engineer* of Saturday's date) take rank as one of the most extraordinary occurrences that ever engaged the attention of Captain Shaw and his brigade. It is not the magnitude of the fire so much as its character, and the circumstances that led to it, which claim consideration. The scene of the disaster was a road bridge crossing the railway, about 300 yards to the north of the Farringdon Street Station and leading from Clerkenwell Road to Clerkenwell Green. Underneath the bridge were two double lines of railway—one pair serving for the Great Northern, the Midland, and the London, Chatham, and Dover traffic, while the other carried the Metropolitan trains. The two systems of traffic were separated by a brick pier, supporting the centre of the bridge. In contact with this pier was a timber-shed, as long as the bridge was wide, and containing about twenty barrels of naphtha, the property of the Metropolitan Railway Company. Overhead was the bridge, massively constructed of brickwork and iron girders, the latter of considerable size. It was a strong bridge; and in among the girders were two immense gas-mains, the largest being the rectangular equivalent of the 48-inch main, running from Beckton to Fulham—a distance of 15 miles. The other was equal to a circle with a diameter of 36 inches. These were both trunk mains, having no service-pipes, and carrying gas at high pressure. It will be seen that everything was admirably arranged for a species of volcanic outburst at some time or other; and it so came to pass. There was all the greater risk of an explosion from the circumstance that the naphtha-store was in a confined situation, where ventilation would be difficult. The weather was warm, the shed was shut up for forty hours, and in the meantime became filled with inflammable vapour from the volatile naphtha or "spirit." The custodian of the stores opened the shed on Monday morning, and, perfectly unsuspicious of danger, struck a match. In an instant, the vapour took fire, the naphtha blazed up and exploded, and the tremendous flame, accompanied by enormous volumes of smoke, speedily roused the whole neighbourhood. The Fire Brigade were quickly on the spot; but water was of little use against so inflammable a liquid. The iron girders of the bridge became distorted by the terrific heat; the two great pipes were fractured, and torrents of burning gas added to the fury of the conflagration. The roadway sank, and the traffic of an important thoroughfare was stopped; while the railway trains were also interfered with. Fortunately, the central depôt of the Gas Company was near at hand, and from this spot the Chief Distributing Engineer (Mr. G. F. L. Foulger) was able to send messages along the private wires of the Company in all directions, so as to summon help, and control the working of the valves connected with the various mains. A strong body of men, employed by Messrs. Aird and Sons, contractors to the Company, was promptly set to work by Mr. Foulger to cut off the flow of gas. The task was a heavy one, and fraught with some danger; but it was successfully accomplished. So well did Mr. Foulger govern the valve arrangements in different localities, that pressure was kept up in the mains running from the bridge westward, and all danger of an explosive mixture with atmospheric air was prevented. The gas being thus effectually dealt with, it only remained for the naphtha to burn itself out, leaving a shattered bridge and an intercepted roadway. So energetic has been the action of the Gas Company that, by this time, the 48-inch main will probably be once more in working order, though, of course, in a temporary form. The 36-inch supply will be provided for in some other way, until the bridge is in the course of complete repair. It is well that this disaster happened at a period of the year, and in a state of the weather, when the consumption of gas is considerably below the maximum. But for this circumstance, it would probably have been found impossible to have kept up the requisite pressure in the supply, and the public would have been seriously inconvenienced. It may be presumed not only that the Gas Company were unconscious of the existence of this naphtha-store, but that the London County Council were equally in the dark. The shed ought to have been licensed, if allowed to exist at all, and proper regulations should have been enforced as to the quantity of naphtha to be stored, and the amount of ventilation to be effected. The Metropolitan Board some time back, and the County Council subsequently, would be the licensing authority; and it is tolerably certain that neither the one nor the other would have allowed a naphtha-store to be established underneath a couple of gigantic gas-mains. Assuredly the Gas Company would have protested against such an arrangement, and so would the public, had they known of it.

The Labour Association and Profit-Sharing Schemes.—At the annual general meeting of the Labour Association (the object of which is to promote co-operative production, based on the co-partnership of the workers) last Thursday evening at Essex Hall, Essex Street, Strand, the Secretary, Mr. Ivimey, gave an account of the work done by the Association from the end of 1889 down to last month. He said that the various profit-sharing schemes in which they were interested were those of the South Metropolitan Gas Company, Messrs. Peto Brothers, the Thames Iron-Works, and Messrs. Clarke, Nicholls, and Coombs. Unfortunately, however, with the exception of the South Metropolitan Gas Company and Messrs. Clarke, Nicholls, and Coombs, the other profit-sharing schemes had been temporarily abandoned, owing to the antagonistic attitude of the several Trade Unions. The great stumbling-block had been the clause providing that, in the event of strikes, the share of profits should be forfeited. A question often asked in a sceptical spirit, "How about workers sharing in losses as well as profits," had received a very practical answer from the workers of Messrs. Thomson and Sons, of Huddersfield, whose business was based on industrial partnership lines. Last year it was found impossible to pay any interest on share capital; and the workers resolved to pay interest themselves out of their own wages. A short discussion followed, in which it was urged that the question as to the admission of workers to a share of management as well as of profits had not received sufficient attention.

AN ELECTRIC LIGHTING INSTALLATION AT FAREHAM.

The electric lighting plant which Messrs. Lang, Wharton, and Down have been putting down for the Fareham Electric Light Company, was started last Thursday week; and the local papers pronounce the light to be a great success. The Directors of the Company celebrated the event by a banquet, at which a statement as to the position of the concern was made by the Secretary (Mr. Blake). He said that the Company had a capital of £5000 in £1 shares; and there were sixty shareholders who held 3900 shares. He had no doubt whatever that the remaining 1100 would soon be taken up when it was seen that their efforts, which were for a long time deemed out of the question, had proved successful. He added that there was plenty of room for both gas and electric light; and it had never been the experience of the past that a new illuminant did away with an anterior one. In the course of a published description of the installation (evidently from the pen of someone closely interested), it is said: "The wires are carried on tall poles to comply with the Board of Trade regulations; and as the principal street is a long straight one, this method of wiring does not present any great difficulty. The two chief streets, with a united length of about a mile, are lighted with 21 arc lights on the Thomson-Houston system. Each lamp is calculated to give a light of 1200 candles; but owing to the use of opal globes to disperse the light, probably each lamp does not give an actual light of more than 900 candles. The result is, however, eminently satisfactory, as the streets in question are so light that good print can be easily read at any part of them. The other streets of the town are lit by incandescent lamps of 20-candle power each; and, by an arrangement with the Local Board, are placed at every point where a gas-lamp was situated. As the gas-lamps only gave a light of 15-candle power, there is a slight gain of light at each lamp. There are thus two systems, necessitating two separate sets of wires—one for each kind of lamp. For the public lighting, about 12 miles of wire are used. It is insulated with okonite. Another set of wires will shortly be run for the purpose of private lighting. The central station, where the motive power and the dynamos are situated, is a long building, built of brick; and the end of it, which contains the dynamos, is match-boarded, in order to keep out damp. It is furnished at present with a boiler, an engine, and two dynamos—one for the arc lights and one for the incandescent. . . . The light was first publicly displayed on Sept. 1, and has been running every night since, with only three or four interruptions (never lasting many minutes) due to slipping of the driving-belts and slight heating of bearings, almost inseparable from quite new machinery. These have now been overcome, and both machinery and lamps work beautifully. The Company have entered into an agreement with the local authorities to light the town for three years for £500 a year, and give an average of eight hours' light every night all the year round."

THE DUBLIN CITY COUNCIL AND ELECTRIC AND GAS AFFAIRS.

A Local Government Board Inquiry.

Last Friday week, Mr. C. P. Cotton, C.E., Chief Engineering Inspector of the Local Government Board, held an inquiry at Dublin in relation to an application by the Corporation, acting as the Urban Sanitary Authority, for the sanction of the Board to the following loans: (1) A sum of £50,000 for the purpose of an installation for the supply of electricity; (2) a sum of £3500 for the erection of stables; (3) a sum of £3000 for the purchase of ground and erection of buildings for gas and meter testing offices; (4) a sum of £5000 to supplement a loan already obtained for market purposes; (5) a sum of £1500 for the purpose of providing improved pumping power for the drainage of the South Lotts, Forbes Street Station.

At the opening of the proceedings, the INSPECTOR intimated that he had not received any objections to the proposed loans.

Mr. M'SHEEHY, Law Agent to the Corporation, said the first of the five matters to be inquired into was the most important. The work was proposed to be carried out under the combined operation of the Electric Lighting Act of 1882 and the Public Health Act, under the provisions of which the powers of borrowing were to be exercised. In 889 the Corporation obtained from the Board of Trade a Licence for public electric lighting; and in 1890, they were granted a supplemental Order, empowering them to supply electric lighting for private purposes. As to the loan for the purchase of ground and the erection of buildings for gas and meter testing offices, this was rendered necessary by the new state of affairs intended to be carried out with respect to gas supply and lighting in the city; considerable differences having arisen between the Gas Company and the Corporation in reference to the testing of gas and other matters. An arbitration was held on the subject in the autumn of last year, which resulted in an agreement being arrived at by which the plant—consisting of lamps, lamp-posts, &c.—was to be acquired by the Corporation, and better arrangements for testing to be provided, including the establishment of a more convenient testing-place on a site in Tara Street. Another item of the award of the Arbitrators was that the site for the testing-station was to be given to the Corporation at a nominal rent for a substantial term of years. The present meter-testing station and offices were situated in a very remote and inconvenient place at East Hanover Street. The testing of meters was not a matter of loss to the Corporation, for they received fees for it; and it would be shown that all the operations connected with meter-testing, the repair of the lamps, &c., should be conducted in one place.

Mr. *O'Donnell*, City Accountant, was examined as to the financial position of the Corporation; and he stated that it was proposed that the amount of the loans should be obtained by the issue of municipal stock.

Mr. *Beveridge*, the Town Clerk, deposed that the subject of electric lighting had occupied the attention of the Council since May, 1887. He was aware that they were desirous of utilizing the plant proposed

to be established for public lighting for the purpose of supplying private consumers also. The Committee, after long consideration, came to the conclusion that this would be the most economical course. The term of years for which the loan of £50,000 was asked was 42.

Mr. *Harty*, the City Engineer, was asked as to what extent he thought electric lighting would be privately utilized in the city; and he said that, according to an estimate which he originally made, at least 200 houses would take it. Since then a circular had been sent out, in response to which absolute promises had been given by the occupiers of nearly 190 houses. These included large establishments, two or three of which were anxiously inquiring when the supply would be ready. There could not be a better site for the works than the one suggested. Of the £50,000, it was only proposed at present to expend £37,130, of which £4200 would be for buildings and the rest for plant. The remainder would only be taken as required.

Mr. *E. Manville* stated that he had been engaged by the Corporation as Electrical Engineer since they took up the question of electric lighting. The amount estimated by Mr. Harty would be sufficient for what was proposed to be done; and it would take about six months to put up the works.

Evidence was then given in reference to the loan for gas and meter testing offices.

The *High Sheriff* (Mr. Alderman Perry) averred that the existing accommodation in Hanover Street for gas-testing, &c., was entirely inadequate.

Mr. *T. J. Cotton*, Inspector of Public Lighting, stated that at present the Corporation tested gas-meters for the whole of Ireland; and the fees which they received for doing so amounted to about £212 per annum. Some towns were obliged to send their meters out of Ireland for testing, because, in consequence of the limited accommodation in Dublin, their requirements could not be met with sufficient despatch. Witness believed that enlarged and improved accommodation would lead to an increase in the amount of fees received.

Witnesses were then called in support of the other loans required; and the inquiry terminated.

Sale of the Penryn Gas-Works.—On Monday of last week, the Penryn Gas-Works were offered for sale by auction, at the King's Arms Hotel, Penryn, by Mr. Thomas Gill; and after a lively competition, in which Mr. J. W. Buckley, the Manager of the Falmouth Gas-Works, took part, they were disposed of to Mr. H. Dawe, the Harbour Master at Penryn, for £665. Some particulars concerning these works appeared in our advertising columns on the 9th inst.

Practical Instruction in Plumbing.—The introductory lecture to the ninth annual course of lectures and practical instruction in plumbing will be delivered at the Polytechnic, on Tuesday next, by Mr. J. Wright Clarke. The Master of the Plumbers' Company will preside; and he will also present the prizes to the successful students of last session. Plumbers and others interested in technical instruction may obtain tickets of admission, free, on application to the Secretary, Polytechnic, No. 309, Regent Street, W.

Abolition of Gas-Meter Rents at Leigh.—At a meeting of the Leigh Local Board Gas Committee last week, Mr. J. Fairclough proposed that the payment of gas-meter rents be abolished, as he believed that many householders refrained from using gas on account of having to hire meters. A report prepared by the Gas Manager (Mr. A. F. Fletcher) showed that there were 1397 houses in the district fitted up for gas that have no supply, of which number 973 have services from the street mains. Mr. Fairclough remarked that at Burnley, since meter-rents were dispensed with, the number of consumers had very considerably increased. The motion was seconded and carried.

D. Hulett & Co., Limited.—The first annual meeting of the shareholders of D. Hulett and Co., Limited, was held at their Offices, at No. 55 and 56, High Holborn, yesterday week. Mr. W. Benson presided, and in presenting the report and balance-sheet, congratulated the shareholders upon their first year's working. The business had shown a very considerable increase for the twelve months; but the Directors had resolved not to pay a large dividend. As there had been some very heavy extraordinary expenses, it was decided to pay these off in full out of the first year's profits. A dividend of 6 per cent. was declared after paying which a balance of £1200 remained to be carried forward. The Managing Director (Mr. J. H. Sheldrake) was congratulated upon the result of the year's trading.

Rothwell in Darkness.—The Local Board of Rothwell, near Leeds, have had under consideration tenders for the supply of gas to the street lamps. The Rothwell Gaslight Company offer to supply at 3s. 9d. per 1000 cubic feet, an advance of 3d.; and the Leeds Corporation also advanced their price for the lamps at Stourton by 5s. each. In consequence of the refusal of the Company to take 3s. 8d., as proposed by the Board, the streets of Rothwell have been in darkness, much to the annoyance and discomfort of the inhabitants. A petition was presented to the Board, and a resolution passed accepting the Company's offer, so that the people should not further suffer. A notice to rescind this resolution was, however, immediately afterwards given, and the well-meant resolution cannot be carried out for another fortnight.

Heywood Corporation Water Supply.—At the last monthly meeting of the Town Council, Mr. Buckley in moving the adoption of the Water Committee's minutes, said with regard to the "middle" reservoir, that they could practically see the end of the expenditure. The outlay up to the present time had been £23,809; but this included £571 as capitalized interest. There was a sum of £3980 for iron mains and materials; the Knot Farm, which they had to purchase, cost £1337; and the wages for workmen and contractors had amounted to £17,919, inclusive of the wages paid for laying pipes, &c. The original estimate of the engineer for the works then contemplated had not been exceeded. Up to the present time the work had given perfect satisfaction; and he thought, when the reservoir was completed and in use, it would be found that the work had been absolutely necessary, and that the money had not been badly spent. The minutes were adopted.

THE RELATIVE COST OF GAS AND ELECTRICITY IN COTTON-MILLS.

[From the *Electrical Review*, Sept. 19.]

When it is attempted to draw comparisons between gas and electricity and their relative cost, it is not unusual to estimate the former by simply referring to the actual cost of the gas consumed as registered by the meter; whilst the cost of an electric light is obtained after every possible charge has been put down to its account. Such a result not infrequently places the electric light at a serious disadvantage from the economical point of view. But an estimate of this character is far too one-sided to give a true statement of the case. Those who are interested in the electrical industry do not object in the least to have the electric light properly debited with all the incidental and necessary items; but they do naturally object that on the gas side all the incidental items, save that of actual consumption, should be omitted. Neither is it fair altogether to omit from these calculations the relative benefits, or otherwise, derived from the use of the two illuminants.

As we have remarked, an electric light installation is debited with all its charges to the capital account; and in its maintenance not only is the depreciation of the plant considered, but every item due to repairs, wages, &c., is fully considered and provided for. On the gas side, however, no such items are usually taken into account. But, dealing with the gas question in a large mill or manufactory, there are a number of expenses necessarily entailed, which should certainly be taken into account when a perfectly true and reliable comparison is desired. For instance, the installation of a gas plant of 1000 or more lights into a large mill entails the expenditure of a considerable amount of capital, although it is known that a gas plant can be put in at the present time for a very small sum. There are, however, many mills where the capital expended upon the gas installation has cost 20s. per light; whilst at the present time they can be installed for as low as 5s. or 6s. per jet. Still, this requires some capital, and necessarily should be subject to some charge for depreciation. The lighting up of a large mill, and the extinguishing of these lights, requires a considerable amount of labour and time. The value of wages taken up per annum in this alone is a serious item, but it does not count. It will be found that where there are a large number of lights in use, there is almost always a gas-man employed in looking after the fittings, and keeping everything in proper repair. But his wages are not counted, nor are the various items which usually come under the head of repairs; for it is impossible to conceive that gas-pipes and fixtures are never out of order.

When the relative charges are properly considered, a more reliable estimate can, therefore, be obtained; but there are circumstances which prevent such a comparison being made. This is owing to the fact that it is very rare for the cost of the maintenance of an electric light installation to be kept. We are aware, however, of several cases where this has been done; and we have had the following statement presented to us for publication, which gives the information in a comparative form, prepared by the proprietors of some very large mills in the neighbourhood of Manchester. These results give the relative cost of gas and electricity for a period of six years, taken from the actual working experience of one of the Company's mills at Mosesgate, near Bolton. The statement is given exactly as handed to us.

HORROCKS, CREWDSON, AND CO., LIMITED, BOLTON.

Gas v. Electricity at Mosesgate.—Six Years to Dec. 31, 1889.

826 gas-lights—cost for piping, meter, &c.			£215 2 2
Depreciation at 5 per cent. per annum—6 years = £73 12s. 11d.; or, per annum	£ 12	5	6
Average gas account, per annum.	217	11	3
			826/229 16 9
Cost of gas per light per annum			£0 5 6½
Electric installation (263 lamps) cost, including gearing, belting, &c.			£410 17 9
Depreciation at 7½ per cent. per annum (six years) .			£153 10 1
Renewal of lamps, repairs, &c.			101 11 4
Power estimated at 30 ind. horse power, at £5 = £150.			
Depreciation on £150 for six years, at 5 per cent. per annum			39 14 4
Coal at 3·7 lbs. per ind. horse power per hour (275 hours per annum), for six years, at 6s. per ton . .			22 2 0
			6/316 17 9
Cost per annum			263/ 52 16 3½
Cost per lamp per annum			£0 4 0½

Cost per light per annum, gas, 5s. 6½d.; electricity, 4s. 0½d.

Gas costs 38·34 per cent. more per light; and (as one electric light displaces two gas-lights in the weaving-shed) gas costs 176·68 per cent. more per loom.

It will be observed that, in the foregoing statement, the gas account is simply debited with the average gas consumption, and a depreciation charge of 5 per cent. on the original cost; nothing being allowed for repairs and such other charges as we have previously mentioned.

The account for the electric installation of 263 lights includes dynamos and everything that is necessary to a complete plant. The work in this case was satisfactorily done by the Manchester Edison-Swan Company, Limited; and it is gratifying to notice here that, throughout the six years, the working has been of a satisfactory character. The charge for depreciation is 7½ per cent., or one-half more than in the case of gas. The power of the steam-engine is estimated at 30 indicated horse power; this being the proportion of the main engine of the mill utilized for the purpose of driving the dynamo. Tests subsequently made showed that the actual indicated horse power utilized was only 27-horse power; and at this figure the coal consumption has been calculated. The items for repairs, &c., include the cost of oil and sundries, besides lamp renewals. It will, therefore, be seen that full charges have been debited to the electric light account.

It may probably be remarked that no charge has been made on account of wages; but as the engineer in charge of the engines has done this small amount of work as part of his ordinary duty, no charge has been made, for no extra expense has been incurred. Under these circumstances, the electric light shows a very distinct economy over gas; and it must be acknowledged that, in the case of a weaving-shed, the result is very remarkable.

The present is a case where the mill-engines have had their surplus power utilized in favour of the electric light installation—a case by no means unusual, and one which would undoubtedly be more frequently adopted if mill-owners were more alive to this fact. In a very large number of instances, the power required for the electric light has been in excess of that which could possibly be obtained from the mill engine, and an independent engine has been provided; and in other instances it has been considered advisable to have the power for the electric light quite independent. In these circumstances, again, an economy in the use of the electric light has been proved; and in a succeeding number we propose to give some details of the cost of working with the additional charge of independent engines.

THE EAST WARWICKSHIRE WATER-WORKS.

These works were authorized by Act of Parliament a few years ago to supply an area including the urban sanitary districts of Nuneaton and Chilvers-Coton and two smaller towns in the Foleshill rural sanitary district; the whole embracing a population of about 17,000. The area was miserably supplied with water, almost the only sources of supply being shallow and polluted wells and dipping places at the side of the road, where there happened to be a surface spring—the latter often quite dry in the summer. Yet the sanitary authorities declined to take the matter in hand, and it has been left to a few gentlemen of spirit in the town and neighbourhood to carry out this greatly needed work. The undertaking was commenced by the formation of a Syndicate for the purpose of proving the existence of a proper supply of water. Under the advice of their Engineer, a well was sunk about three miles west of Nuneaton. This spot is not far from the middle of the Warwickshire coal basin; the coal measures being at a great depth, and overlaid conformably with thick beds of sandstone and marls belonging to the lower Permian formation. The marls in which the well commences proved thicker than was expected by geologists; the sandstones not being reached till a depth of about 250 feet. The well has been continued to a depth of 330 feet, chiefly through very hard rocks, which yield an abundant supply of water. Headings have also been driven in several directions from the lower part of the well. The water has been analyzed by Drs. Frankland and Attfield, both of whom pronounce it excellent as regards purity; the hardness also being extremely moderate. The well itself is most substantially constructed; being completely lined with blue brick in cement from the surface down to the rock. Two 12-inch lifts have been fixed; the pumps having a stroke of about 14 feet. The lifts are arranged in two portions, owing to the depth; the lower lift discharging into a cistern midway to the surface. The permanent engines are of the horizontal compound tandem type; the high and low pressure cylinders being respectively 12 inches and 23 inches in diameter, and the stroke the same as that of the pumps. One lift is capable of raising 20,000 gallons of water per hour into reservoirs a total height of 340 feet. The two supply reservoirs are close to the well, at a spot on table-land at a sufficient elevation to supply the whole of the district—being 480 feet above Ordnance datum. The reservoirs contain 300,000 gallons, and are constructed of brickwork in cement and concrete covered in with brick arches. The upper end of the pump-lifts is closed in, and the pipes continued directly into the reservoirs; so that practically the water is never exposed to the daylight till it is drawn at the consumer's tap. Eleven miles of mains, from 3 to 10 inches in diameter, have been already laid, giving access to about two-thirds of the district, with fire hydrants and other appliances.

If any evidence were required that the undertakings were really needed, says the *Engineer*, from which the foregoing particulars are extracted, it has been abundantly afforded by the constant and ever-increasing demand. The supply was only commenced between two and three years ago, and the sum received for water is now fast approaching £1000 a year. Under these circumstances, it is not surprising that the Nuneaton Urban Sanitary Authority are commencing negotiations for the purchase of the works, which were designed by Mr. J. Anstie, C.E., of Victoria Street, Westminster, under whose directions they were carried out.

Gas-Works Extensions in Australia.—Since the disastrous floods which occurred in the Castlemaine district in January of last year, the local Gas Company have carried out several important improvements at the works, which were damaged to a great extent by the flood waters. These improvements must tend to materially benefit the Company and the public generally; for it is already an admitted fact that ere long the residents of Castlemaine will be supplied with gas at a considerably cheaper rate than that charged at the present time. A few months ago a contract was let to Mr. W. W. Monk, the Victorian representative of Messrs. C. and W. Walker, to supply a new scrubber, retort stack, and gasholder. The last-named plant has been completed; and on July 25 the Directors, together with Mr. Monk and Mr. Blackman, the Secretary and Manager of the Company, met at the gas-works for the purpose of witnessing the ceremony of turning the gas into the holder, which has a capacity of 15,000 cubic feet, and has been erected at a cost of £760. Everything being in readiness, Mr. M'Gregor, the Chairman of the Board, turned on the gas into the holder; and in doing so he expressed the hope that the improvements that had been carried out by the Company would result very beneficially to the shareholders, and that the consumers of gas would also derive a benefit by having to pay a cheaper price for it than at present. With his co-Directors, he said he was highly pleased with the holder, which he felt certain would give the utmost satisfaction for many years yet to come. Nearly £2000 has been spent altogether in the various improvements at the works.

METROPOLIS WATER SUPPLY.

The Quality of the Water during the Month of August.

The returns furnished to the Registrar-General by the London Water Companies as to the water supply of the Metropolis during the past month, show that the average daily supply was 185,011,729 gallons; being at the rate of 31 gallons per head of the population, as compared with 30·3 gallons in August, 1889. Of the entire bulk of water sent out, 92,429,690 gallons were drawn from the Thames, and 91,582,039 gallons from the Lea and other sources. Reporting upon the quality of the supply, Dr. E. Frankland observed: Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies and by the Tottenham Local Board of Health, was: Kent, 0·6; Tottenham, 0·7; New River, 0·9; Colne Valley, 1·6; East London, 2·1; Southwark, 2·9; Chelsea, 3·5; West Middlesex, 4·4; Grand Junction, 4·6; and Lambeth, 4·8. The water obtained from the Thames by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies suffered greatly from heavy rains and consequent floods, the proportion of organic matter observed in recent months having been much increased in every case, and more than doubled in the supplies of the West Middlesex and Grand Junction Companies. Nevertheless, all these waters were efficiently filtered, and were being delivered in a clear and bright condition at the time the samples were drawn. The water obtained chiefly from the River Lea by the New River and East London Companies was also efficiently filtered; and the New River Company's supply practically maintained the high degree of organic purity which it has of late exhibited. The water supplied by the East London Company, though better than any of the Thames-derived waters, was considerably inferior to that sent out by the same Company in July. The deep-well waters of the Kent and Colne Valley Companies and of the Tottenham Local Board of Health were, as usual, of excellent quality for dietetic use. These waters were clear and bright without filtration. The Colne Valley Company's supply was softened before delivery, and thus rendered suitable for washing.

Messrs. Crookes, Odling, and Tidy, in their report for last month on the composition and quality of daily samples of the water supplied to London, say: The generally satisfactory character of the water supply during the month of August is well indicated by a comparison of the mean and maximum proportions of organic carbon found in the Thames derived waters distributed to the Metropolis during the months of June, July, and August respectively, thus—

	Mean.		Maximum.	
June	·150	..	·166	Parts per 100,000.
July	·152	..	·185	
August	·150	..	·175	

But just as the numbers for July were somewhat heightened by the occurrence during the latter part of the month of a flooded state of the rivers, brought about by the unprecedented rainfall of the 17th of July, so were the numbers for August similarly heightened by the persistence, during the early part of the month, of the previously brought about floods, sustained as they were by a considerable rainfall in the weeks following that of the above-mentioned wholly exceptional fall. The proportion of organic matter present in the water, as determined alike by the estimations of organic carbon found and of oxygen consumed, though affected sufficiently to render analyses made on an early day in the month no fair criterion of the character of the month's supply, was nevertheless influenced by the floods but to a very inconsiderable extent only, as noted also in our previous monthly report. The degree of colour-tint of the water, however, when viewed through a thickness of 2 feet, was found to be more appreciably affected. Thus, while the mean ratio of brown to blue tint of the Thames-derived water was during the first half of the month of August as 20 : 20, it was found during the last half of the month, after the subsidence of the floods, to be only as 14·1 : 20.

The Question of Electric Lighting in Leeds.—At a meeting of the Sub-Electric Lighting Committee of the Leeds Town Council last Wednesday, a draft report dealing with the question of adopting electric lighting in Leeds was discussed. It was agreed to lay the report before the whole Committee on Monday (yesterday). The Committee will, in turn, report to the Council, who will probably then decide whether a company or the Corporation are to carry out the scheme.

Canterbury Gas and Water Company.—An extraordinary meeting of the shareholders of this Company will be held next Thursday, to authorize the creation and issue of new "A" stock, not exceeding in the whole the sum of £5000, for the purposes of the undertaking; to authorize the raising on mortgage of the Company's water-works undertaking a sum not exceeding £12,500; to consider the propriety of making, and if so determined on, to make an order to reduce the number of Directors from twelve to nine; and to consider the propriety of converting into share capital the present loan capital of £9000 on the gas undertaking, and, if so determined on, to order such conversion.

The Water Supply of Stroud.—A fortnight ago a petition was presented to the Stroud Board of Health, signed by all the medical men and many other influential residents, calling upon them to take immediate steps for the provision of a supply of water to the town, and threatening, as an alternative, an appeal to the Local Government Board. The Stroud Water Company have an abundant supply laid through the town, but have no powers to supply without the Board's sanction; and the Board have always shown themselves averse to going to the Company. Now, however, matters have arrived at a crisis; and the Board have had to face the problem. A special meeting was held last Thursday, when, after two hours discussion, Mr. Holloway, M.P., proposed, and Mr. Hulbert seconded, that the Board should obtain a supply at once from the Company. The motion was carried.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday*.

The little agitation which I mentioned in my last week's notes as having arisen in the Edinburgh Gas-Works over the work at the new bench of regenerative retorts "goes merrily on," and is in no danger of being snuffed out by the labour party. An account supplied by them to an Edinburgh newspaper to-day states that the men "estimate the increased work put upon them at about one-third more than formerly. With their wages and hours otherwise, they have nothing at all to find fault. A protest has been signed against the other work; and yesterday a deputation waited on the Manager, who, however, it was reported, could promise them no relief, and who, it is said, had expressed his determination to continue the new system. This was reported to a meeting of the men held last night, at which, we believe, complaints also were made as to the manner the Manager had received the representatives of the men. Unless some redress is received, it was agreed by the men to give in their notices."

The difference which has arisen between the Peebles Police Commission and the Gas Company, as to the claim of the former for way-leave for the Company's mains, referred to in my last week's notes, seems to be ended so far as the Police Commission is concerned. At their meeting on Wednesday night a letter from the Secretary of the Gas Company was read, in which, while adhering to his contention that the Commissioners were not entitled to make the claim they are doing, he sought to conciliate them by showing that the Company had not acted in an oppressive spirit towards the community. Unfortunately he wound up with a request for a settlement of the account due to the Company for public lighting last year. This seemed to be more than the Commissioners could endure; and they made short work of the Secretary's communication. They at once resolved that the account should be paid; and re-affirmed their resolution to charge the Company £25 a year for the use of the streets—the Commissioners undertaking to maintain the public lamps and to light the town clock entirely at their own charge. Whether the Company will consent to pay the sum claimed, or will dispute it, remains to be seen.

It appears that in Dunfermline it has been the practice since 1872 to charge the Gas Company £20 a year for the privilege of opening up the streets; and at the present time there is a movement under the surface with reference to the public lighting which may lead to wider issues. There has for several years been a desire on the part of some of the public men that the gas undertaking should be taken over by the Corporation; but the subject has not made much headway. The fact is that when it was first mooted, the general feeling was that it would be better to wait till it were seen what the electric light was to develop into; because if it came to anything whatever loss might be sustained by the gas undertaking should be borne by the shareholders of the Company, and not by the community. In the same way, a year ago when the proposal was revived by Mr. Councillor Scobie, it was felt that water gas was likely to be a formidable competitor with coal gas, and that further delay was advisable. Now, when it is seen that neither of these cats will jump, the subject threatens to crop up again. In reality the subject which is being discussed is the agreement with the Gas Company for supplying gas to the public lamps; and so far as it has gone in the Police Commission everything has been quite regular. What I describe as under the surface, is the comment of a local newspaper on the subject, in which a feeling so antagonistic to the Gas Company is displayed that it is evident there is something behind, a something which the editor himself discloses when he speaks of the present as "a time when the gas inquiry question is only in its initial stages." The further stages of the inquiry are evidently reserved by whoever is inspiring the newspaper as a card to be played at the forthcoming municipal elections. Meantime an endeavour is being made to depreciate the Gas Company over their charges for public lighting. By the contract of 1872, the Company agreed to pay the £20 for way-leave; and to charge an average of the price fixed for gas in Edinburgh, Glasgow, Greenock, Paisley, and Kirkcaldy. The contract was for five years, but has continued in force ever since without renewal. What is sought to be established is that in 1885, when the quality and price of gas in Glasgow were reduced, that city was dropped out and the average taken from the price in the other four places. This is spoken of as "a good case for a searching inquiry;" and evidently the newspaper will see that the subject is not lost sight of. The Police Commission meanwhile has not been inactive. They have called upon the Gas Company to say whether they have adhered to the agreement. It was stated at a meeting of the Commission on Monday that the Company had replied, giving the prices in the towns named in the agreement, upon which they proceeded, and as these figures were not the same as had been published by the newspapers, the subject was sent to the Lighting Committee to consider.

The Forfar Gas Corporation have adopted the following estimates for the current year: Revenue, £5402 14s. 9d.; and expenditure, £5386 5s.—showing an apparent surplus of £16 9s. 9d. The present coal contract exists till the middle of October, after which the price of coal, under the new contract, will be 20s. 8d. per ton, instead of 17s. Notwithstanding the rise in the price of coal, and the increased valuation put upon the gas-works, the Corporation at their meeting on Monday resolved to maintain the price of gas at 4s. 1d. per 1000 feet.

The ratepayers of Tain met on Wednesday night to consider the question of public lighting, referred to in my last week's notes; and as the outcome of a great deal of discussion, it was unanimously resolved to light the streets with paraffin oil-lamps. In the discussion, the question of taking over the gas undertaking, or of erecting new gas-works, was frequently referred to; but no resolution was come to except that they should wait for a fortnight and see whether the shareholders of the Gas Company were willing to part with their undertaking at the price of 30s. per share—which is considerably below the sum paid upon each share.

From our Glasgow Correspondent.

GLASGOW, *Saturday*.

Since I last wrote about coal contracts, the Coal-Purchasing Committee of the Glasgow Gas Trust have again been in the market; and this week they have closed a number of additional contracts—for about 90,000 tons, I am informed by members of the Trust who had something to do with the placing of the contracts, while some members of the "trade" who have compared notes with one another, strongly assert that the buying on this occasion has not gone beyond 40,000 or 50,000 tons. I am inclined to believe, however, that the quantity first mentioned is correct—practically, if not actually. But even suppose that 90,000 tons have been purchased at this time, there is good reason to believe that more coal must yet be secured for the lighting season of 1890-91. When the first purchases for this season were made—in June, I think—about 180,000 tons of coal were contracted for; so that the total amount bought for 1890-91 is only 270,000 tons, which is certainly not sufficient for a whole year's gas supply, if the recent rate of increase in the consumption is to be continued during the present year. Of course there is, as previously mentioned, still a quantity of the coal to be delivered that was purchased during last financial year; but that, in some cases, is only coming to hand in a very perfunctory manner, as there is a disposition in more quarters than one to send the coal where the best price is got, with the result that the Glasgow Gas Committee are left in the lurch. Mr. Foulis is experiencing much difficulty and annoyance in this matter; but he has, I am informed, just received full power from the Committee to take strong measures with those coal-masters who may be found sending their coal to other gas-works and failing to implement their contracts with the Glasgow Gas Commissioners. It is non-delivery or unsatisfactory delivery, rather than advance of prices, that is giving concern to Mr. Foulis and his immediate supporters, the Gas Committee; and yet there is to be noted the fact that at this week's purchasings a very decided advance in prices met the eyes of the Contract Committee when the tenders were under inspection. The 90,000 tons contracted for just now are chiefly, I am told, cannel coal, the price which is up very decidedly all round. It is said that in no case has an order at this time been given for more than 10,000 tons for any kind of coal; and the case in point is that of Provanhall gas coal, none of which was bought at the former purchasing, but the price of which is now 2s. more per ton than it was then. Another coal is 2s. 6d. per ton higher in price than it was at that time, when a purchase was made The contract now placed for any additional quantity of that variety of coal is at an advance of price, I understand, from 11s. to 13s. 6d, Then there is the case of another low-class cannel, whose price has gone up 1s. 3d. per ton since the previous purchasing. A rich cannel has been bought at between 24s. and 25s. per ton, which was offered last year (but not accepted) at not much more than half that price. It is said that a specially rich variety of cannel coal was offered at 28s. 6d. per ton; but the Committee allowed that tender to remain "severely alone," remark being made, however, in passing, that the same coal was offered last year at 16s. 6d. per ton, or 12s. less. As may naturally be concluded, the feeling entertained by the Glasgow Corporation Gas Committee and their chief professional adviser towards the coal men is far from being of a friendly character; and from what I hear "outside" there is a disposition to reciprocate that feeling, as the coal men knowing or believing that they have the ball at their feet, are determined to kick it; in other words, they are resolved to take the uttermost farthing that they can get for their coals. It seems to be little, if at all, short of being a case of "pull devil pull baker." Some of the coal men freely assert that they don't care a straw—only they use a somewhat stronger word.

When the Gas Committee's minutes came up for consideration at Tuesday's monthly meeting of the Gourock Police Commissioners sitting as the Gas Authority, the Provost moved that the price of gas be 4s. per 1000 feet for consumers within the borough, and 6s. 6d. beyond. Considering the rise in the price of coal, he thought it was highly satisfactory that they were able to reduce the price of gas this year. In seconding the motion, Commissoner Simpson said that it reflected great credit on Mr. M'Ewan, the Manager, who had controlled the works in such a way that the Commissioners were now able, for the third year in succession—which, he thought, was unprecedented in the history of Gourock—to reduce the price of gas. During the three years they had reduced it 7d. per 1000 feet in all; and he was glad to see that at the end of every year there was a larger surplus. A discussion arose as to the desirability of laying aside a certain sum each year in order to provide for contingencies; but the motion was carried without any amendment being made for the embodiment of that notion. Attention was drawn in a Greenock paper to the fact that in Helensburgh, which is nearly opposite Gourock, and where the population is nearly double that of Gourock, the consumers pay for their gas at the rate of 5s. per 1000 feet.

The purchase of the Dalmuir, Bowling, and Old Kilpatrick Gas-Works by the Partick, Hillhead, and Maryhill Gas Company during the late parliamentary contest, has now resulted in a benefit to the local gas consumers, for instead of having to pay 5s. per 1000 feet for their gas they will henceforth get it at half that price, which is the rate paid in Glasgow and in Partick and the adjacent suburbs. That is certainly a big reduction; but two of the Glasgow papers to-day put it down as a reduction from 6s. to 2s. 6d., and one of them makes the blunder of saying that the Old Kilpatrick works were purchased by the Glasgow Corporation, while the other says that the purchase was made by the Glasgow Gas *Company*.

The Directors of the Lochwinnoch (Renfrewshire) Gas Company have this week appointed a new Manager for their works. There were eleven applicants for the post; and Mr. H. M. Campbell, of Glasgow, was the unanimous choice of the Directors.

There has been a strong market for Scotch pig iron this week, owing to the continued fear of trouble with the men working at the blast furnaces. The ironmasters threaten to damp down all the furnaces, in which case the men will be thrown idle in large numbers. On Monday 50s. 5½d. per ton cash was paid for Scotch warrants; and the closing price yesterday was 51s. 8½d. per ton cash buyers. Last week there were 78 furnaces in blast; and to-day the number is only 73.

Little or no change has taken place in the local coal trade during the week. Export orders are said to be fairly numerous in the market; but as vessels are not coming forward, owing to the uncertainty of being loaded readily, these are not being placed with the producers. No further advance in price of any consequence has taken place during the week. Generally the miners are only working four days per week.

A report of the local sulphate of ammonia market for the past week says: The market has been very depressed during this week, and business has been almost at a standstill. For spot, £11 8s. 9d., usual terms, f.o.b. Leith; has been paid; and makers in some cases are inclined to accept even less. The Continental demand is almost *nil* as yet; and there has been very little doing in forward business.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 20.

Sulphate of Ammonia.—Were it not for the weakness reported from Scotland, the position of the market would otherwise be considered satisfactory. As it is, the Leith and Glasgow quotations are used by dealers (whose interests it might be assumed should lie in a contrary direction), as a means to get quotations at English ports reduced to a lower level; and although the effect is by no means marked, it has caused a certain amount of stagnation, which it is difficult to ignore. Much, if not almost everything, will depend upon the near demand. While it is generally recognized that speculators are in want of spot parcels, it must be feared that an improvement in prices will be opposed from this quarter until competition is created by new business. It is not unlikely that there will be a more active market in October, as it may fairly be assumed that Continental consumers have covered but a portion of their requirements. Quotations are £11 10s. to £11 12s. 6d., Hull and Liverpool; and £11 7s. 6d. to £11 10s., f.o.b. Leith. Nitrate is rather firmer.

Sales of Stock and Shares.—A few days ago there was sold by auction £420 of "B" (7 per cent.) stock in the *Broadstairs Gas Company*. It realized £650.——Last Wednesday 30 shares in the *Worksop Gas Company* were submitted to public competition in the Town. Ten £5 shares, bearing interest at 7 per cent., sold at £8 12s. 6d. each. Five £10 shares earning a dividend of 5 per cent., realized £12 10s. apiece; five £10 preference shares were sold at £12 15s.; and ten £5 preference shares paying 7 per cent., fetched £8 15s.

The Supply of Gas to Balloons at the Military Exhibition.—Last Saturday, The Gaslight and Coke Company made special provision for inflating three balloons simultaneously at the Military Exhibition. The "War" balloon required 50,000 cubic feet of gas; the "Military" balloon, 24,000 feet; and the "Midget," 15,000 feet. The service was a 4-inch main running from a 36-inch main at a distance of 120 yards. By using a four-way piece, the balloons were inflated together; the largest occupying four hours, and the others two hours. The arrangements were carried out successfully by Mr. W. Eagan, the Senior Inspector, and Mr. H. Young, Divisional Inspector of the Horseferry Road works. This makes the thirty-sixth ascent at the Exhibition; the total amount of gas utilized being about 1¼ million cubic feet.

The Cost of Public Lighting in Cardiff.—The Lighting Committee of the Cardiff Corporation last Tuesday had their attention drawn by Mr. Carr to the question of the lighting of the borough; and he asked if it would be possible to have presented at each meeting of the Committee the cost per cent. of the lighting on the rateable value of the town. They appeared to be increasing the public lights at every meeting; and he wished to know whether or not the cost for public illumination was on the increase. Mr. Mildon said he believed they would find that there had been a "terrific" expense incurred, if they compared the cost at the present time with six or seven years ago. Mr. Greenhill, Assistant Engineer, stated that there would be no difficulty in making a return of the kind proposed; and he added that on June 24 last, they had in use 1829 16-candle power lamps, each costing £2 16s. a year; 18 150-candle power lamps, each costing £12 10s.; 113 130-candle power lamps, at an expense of £6 17s. 6d.; and two 50-candle power, at a cost of £6 each per annum.

Crystal Palace District Gas-Works Athletic Club.—There are not many gas-works where there is so much *esprit de corps* between the officials and the men as exists at the Crystal Palace District Gas Company's works; and this is especially shown by the great interest which the former manifest in the recreation of the latter. The Directors have provided a cricket ground for the men close to the works, and not long since an athletic club was formed, of which Mr. Charles Gandon (the Engineer) is the President; Mr. J. C. Watson, the Vice-President; Mr. W. J. Arliss, the Treasurer; and Mr. T. Hardy, the Secretary. Last Saturday week, the first annual sports were held by the members on the cricket field; and these attracted great interest in the neighbourhood—considerably more than 1000 persons being present. There were sixteen separate competitions of a miscellaneous description; and the manner in which they were carried through would have done credit to athletes of older standing. The Works Brass Band was in attendance; and the weather was very fine. It is worthy of note that the Company headed the prize fund with a subscription.

Northern Coal Trade.—The coal trade has been slightly easier for the last few days; the supply of shipping tonnage being small, and the shipments consequently restricted, whilst the restarting of the Monkwearmouth Colliery is enlarging the output of some kinds of coal. Steam coal is fairly steady, at about 13s. per ton free on board, though in a few cases slightly lower prices have been taken. Small steam coal sells well at about 6s. 6d. to 7s. Bunker coal for steamships is easier; the price varying from 9s. 6d. to 10s. 6d., free on board, for unscreened. In gas coals, the general price asked is 11s. 6d. free on board; and the demand is fairly full—the local consumption enlarging. Two or three local contracts for gas coal are now in course of negotiation. One of these is the largest that is allotted in the north—that for Newcastle. The price has not officially transpired, nor is it expected that there will be an official decision for a few days; but the idea in well-informed circles is that the price to be paid will vary between 10s. 6d. and 11s. per ton delivered. In a few days, however, the truth or otherwise of this rumour will be tested. The consumption of gas seems to be increasing in the north, though there is this autumn more competition with the electric light. In other classes of fuel, the price has not changed much this week. Best coke for blast furnaces is quoted from about 17s. 6d. to 18s., free on board. There is no alteration in the price of gas coke.

Gas Cookery Lectures.—The Gaslight and Coke Company held a four days' exhibition of gas appliances at the Chelsea Club Hall, Fulham Road, commencing on Tuesday last. There was an average attendance of 200 persons twice daily. Miss I. Cameron, who has an exclusive engagement, gave her celebrated lectures; the assorted dishes being produced with much rapidity and excellence. A novelty on Wednesday evening was a demonstration of what can be cooked by gas-rings only; these handy burners being lent free by the Company. Miss Cameron continues her lectures for eight days at St. Saviour's Hall, Battersea, commencing to-day.

Poisoned by an Escape of Gas.—Last week, an inquest was held at Gorton, concerning the death, by gas-poisoning, of Thomas Thorpe, aged 17. The evidence went to show that on Tuesday evening, he complained of being ill; and on Wednesday morning was found by a neighbour lying in bed unconscious. There was a strong smell of gas in the room; and the gas-tap was turned full on. A doctor was sent for; but deceased never recovered consciousness, and died on the afternoon of the following day. It was supposed that the gas was left on by a lodger, who stated that he thought he had turned the gas quite out when he left home for his work on Wednesday morning. The cock, however, was loose, and turned completely round, and it was possible that by mistake he left it on. The jury returned a verdict of "Death by misadventure."

The Lancashire Coal Trade.—Business in the coal trade shows no improvement upon last week, and transactions have been of a limited character. House fire coal is not selling so well, and a decline of from 3d. to 6d. per ton is recorded on the week. The inquiry for descriptions of coal suitable for steam and iron manufacturing purposes has, if anything, been slightly better; but there is no change in values, although in certain quarters concessions are offered to effect a clearance of accumulating stocks. Best house coal does not fetch more than 12s. at the pit mouth; and a first-class coal can be bought for 11s. 6d. per ton. Seconds average about 10s. 6d.; and commoner sorts, 9s. per ton. Burgy is still the same, at 7s. 6d. to 8s.; with slack ranging from 7s. for best qualities down to 5s. for inferior sorts. For shipment, steam coal ranges from 10s. up to 10s. 9d., delivered at Liverpool Docks. Coke remains unchanged.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 641.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	16 Apr.	10½	Alliance & Dublin 10 p. c.	10	17—18	..	5 16 8
100,000	10	,,	7½	Do. 7 p. c.	10	12½—13½	..	5 11 1
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	107—109	..	4 11 9
100,000	20	30 May	8	Bahia, Limited	20	20—22	..	7 5 3
200,000	5	15 May	7½	Bombay, Limited	5	7—7½	+¼	5 0 0
40,000	5	,,	7½	Do. New	4	5—5⅜	..	5 9 1
380,000	Stck.	14 Aug.	12½	Brentford Consolidated	100	212—217	..	5 12 11
125,000	,,	,,	9½	Do. New	100	155—160	..	5 15 7
220,000	20	11 Sept.	11½	Brighton & Hove Original	20	40—42°	..	5 9 6
320,000	20	28 Mar.	11½	British.	20	44—46	..	4 17 10
50,000	10	11 Sept.	11	Bromley, Ordinary 10 p. c.	10	18—20°	..	5 10 0
39,000	10	,,	8	Do. 7 p. c.	10	13—14°	..	5 14 3
328,750	10	13 June	8	Buenos Ayres (New) Limited	10	12½—13½	..	5 18 6
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	103—106	..	5 13 2
150,000	20	14 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 4
550,000	Stck.	16 Apr.	13½	Commercial, Old Stock	100	252—257	..	5 7 0
130,000	,,	,,	10½	Do. New do.	100	200—205	..	5 4 10
130,000	,,	27 June	4½	Do. 4½ p. c. Deb. do.	100	117—122	..	3 13 9
557,320	20	13 June	13	Continental Union, Limited	20	48—50	..	5 4 0
242,680	20	,,	13	Do. New '69 & '72	14	33—35	..	5 4 0
200,000	20	,,	10	Do. 7 p. c. Pref.	20	39—41	..	4 17 7
75,000	Stck.	28 Mar.	10	Crystal Palace District	100	195—205	..	4 17 7
234,060	10	16 July	—	European, Limited	10	18—20	..	—
120,000	10	,,	—	Do. New	10	18—20	..	—
354,060	10	,,	—	Do. do.	7½	14—15	..	—
5,470,620	Stck.	14 Aug.	13	Gaslight & Coke, A, Ordinary	100	236—241	..	5 7 10
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	98—101	..	3 19 3
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	250—255	..	3 18 5
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	119—123	..	4 1 3
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	177—182	..	4 2 5
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	162—167	..	4 3 10
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	250—255	..	3 18 5
1,061,150	,,	13 June	4	Do. 4 p. c. Deb. Stk.	100	115—120	..	3 6 8
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	123—128	..	3 10 4
650,000	,,	,,	6	Do. 6 p. c. do.	100	161—166	−2	3 12 5
3,800,000	Stck.	15 May	12	Imperial Continental	100	230—233	..	5 7 7
75,000	5	13 June	6	Malta & Mediterranean, Ltd.	5	5—5½	..	5 9 1
560,000	100	1 Apr.	5	Met. of Melbourne, 5p. c. Deb.	100	112—114	..	4 7 9
541,920	20	13 June	6½	Monte Video, Limited	20	19—20	..	6 10 0
158,000	5	30 May	10	Oriental, Limited	5	9—9½	..	5 5 3
60,000	5	28 Mar.	7	Ottoman, Limited	5	5½—6	..	5 16 8
166,870	10	16 July	4	Pará Limited	10	3½—4½	..	8 17 9
				People's Gas of Chicago—				
420,000	100	2 May	6	1st Mtg. Bds.	100	98—102	..	5 17 8
500,000	100	2 Dec.	6	and Do.	100	95—100	..	6 0 0
150,000	10	16 Apr.	10	Sam Paulo, Limited	10	14—15	..	6 13 4
500,000	Stck.	28 Aug.	13½	South Metropolitan, A Stock	100	281—286	+1	4 11 8
1,350,000	,,	,,	11½	Do. B do.	100	227—232	+1	4 19 1
141,500	,,	,,	12	Do. C do.	100	235—245	..	4 17 11
650,000	,,	27 June	5	Do. 5 p. c. Deb. Stk.	100	142—147	+2	3 8 0
60,000	5	11 Sept.	11½	Tottenham & Edm'nton, Orig.	5	11—13*	..	4 8 5
						*Ex.div.		
				WATER COMPANIES.				
728,446	Stck.	13 June	9½	Chelsea, Ordinary	100	269—274	..	3 9 4
1,720,560	Stck.	16 Apr.	7½	East London, Ordinary	100	212—216	..	3 9 5
544,440	,,	27 June	4½	Do. 4½ p. c. Deb. Stk.	100	140—145	..	3 2 0
700,000	50	13 June	9	Grand Junction	50	120—124	..	3 12 7
708,000	Stck.	14 Aug.	10½	Kent	100	270—275	..	3 16 4
1,043,800	100	27 June	9½	Lambeth, 10 p. c. max.	100	249—254	..	3 14 9
406,200	100	,,	7½	Do. 7½ p. c. max.	100	197—202	..	3 14 3
200,000	Stck.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	122—126	..	3 3 6
500,000	100	14 Aug.	12½	New River, New Shares	100	361—366	..	3 6 3
1,000,000	Stck.	31 July	4	Do. 4 p. c. Deb. Stk	100	125—128	..	3 2 6
902,300	Stck.	13 June	6	S'thwk & V'xhall, 10p. c. max.	100	170—174	..	3 9 0
126,500	100	,,	6	Do. 7½ p. c. do.	100	158—163	..	3 13 7
1,155,066	Stck	13 June	10	West Middlesex.	100	265—270	..	3 14 1

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON." TELEPHONE No. 2698.

GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

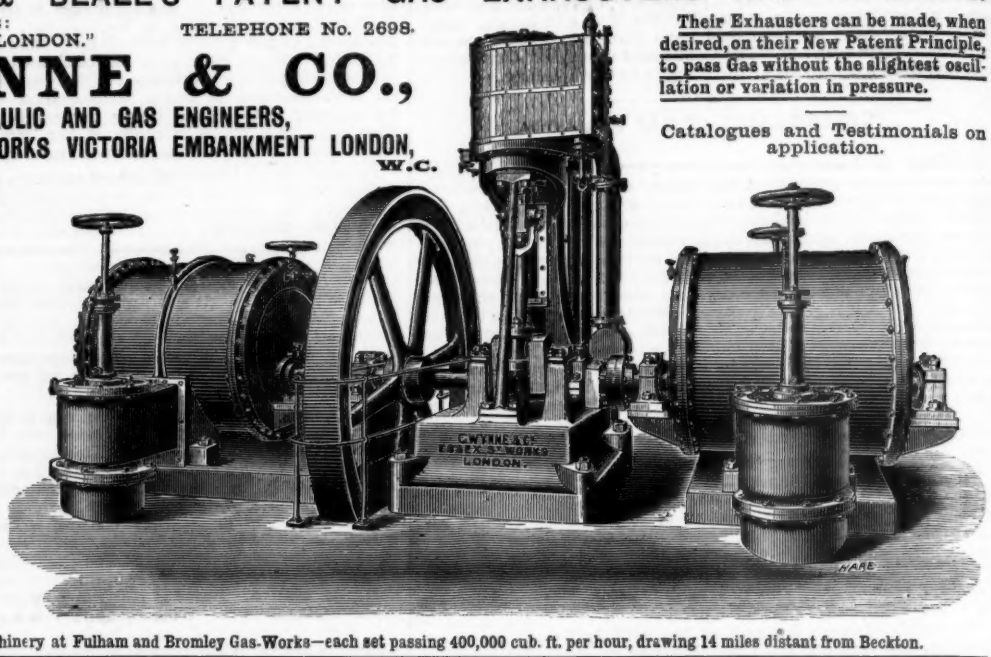
ESSEX STREET WORKS VICTORIA EMBANKMENT LONDON, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co. for Gas Exhausters, &c.

They have completed Exhausters to the extent of 29,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

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Exhausting Machinery at Fulham and Bromley Gas-Works—each set passing 400,000 cub. ft. per hour, drawing 14 miles distant from Beckton.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAYS.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.

Prices, &c., will be forwarded on application to No. 90, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEAR DALKEITH, } SCOTLAND.

BENTLEY & CO.

MANCHESTER ELECTRICAL STORES.

FOR Batteries, Bells, Wires, and Special Electrical Apparatus, address the best house 17, NEWTON STREET, PICCADILLY, MANCHESTER.

EXTRACT from the Harrogate Gas Company's Report, dated the 5th of February, 1890: Coal consumed, 8600 tons. Gas made, 92,880,000 feet; ditto sold, 84,880,000 feet; ditto unaccounted for, 8,000,000 feet; quantity made per ton, 10,800 feet; ditto sold, 9869 feet. Illuminating Power, 16·1 candles. Coals used, Brancepeth. Owners, Strakers and Love, Newcastle-on-Tyne; who have also Brandon Hutton Seam Unscreened Gas Coal. Analysis, 10,500 cubic feet per ton; Illuminating Power, 16·2 candles.

WANTED, Re-engagement as Working MANAGER or FOREMAN. Practical experience in Carbonizing, Engine and Exhauster Work, Fitting, Main and Service Laying, and the erection of Gas Plant. Testimonials showing thirteen years' good character and ability.

Address No. 1861, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a young Man, son of a Gas and Water Superintendent, a SITUATION in a Gas or Water Works. Has had charge of Main and Service Laying, and had experience in general outside Works. Aged 22. Good reference.

Apply by letter to No. 1841, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a thoroughly Competent man, a SITUATION as SERVICE LAYER, METER FIXER, INDEX READER, MAIN TESTER, &c. Thorough practical experience in general outside work. First-class Testimonials.

Address A. B., 16, Station Street, Stratford, E.

TO GAS FITTERS.

WANTED, by the Warwick Gaslight Company, a Competent Gas-Fitter. One who understands Brass Furnishing and Lacquering preferred. Must be a good Workman, and possess proper references as to Character, &c. To a suitable person, this will be a permanent Situation.

Address, stating wages required, W. T. Tew, Gas-Works, WARWICK.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.

Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.

*** See Advertisement p. 666 of this week's issue.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1880, for Wet and Dry Gas-Meters, Station Meters, and Governors, Pressure-Gauges, Street Lamps, and Pillars, &c.

Telegraphic Address: "Braddock, Oldham."

TAR and Liquor wanted.

BROTHERTON AND CO., Commercial Buildings, LEEDS.

A NEW HIGH-POWER GAS-LAMP.

ARRANGEMENTS are about to be made for the INTRODUCTION to the English market of a well-tried and most successful high-power REGENERATIVE GAS-LAMP of Foreign Manufacture. Liberal terms will be conceded to persons willing to take either the sole agency for the sale of the Lamp in the United Kingdom, or for any specially selected district.

Address (in confidence) No. 1858, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

METER REPAIRER wanted, for Brazil, to go out at once. Must have good reference as to character and ability.

Apply, stating wages required, by letter, to G.A.S., MESSRS. DEACONS, 154 LEADENHALL STREET, LONDON.

METER REPAIRER.

WANTED, an experienced Workman in the above branch to UNDERTAKE the REPAIR and TESTING of WET and DRY GAS METERS. Good character and sobriety indispensable. Situation permanent. Wages 28s. per week.

Apply, giving particulars as to past and present employment, and references as to character and ability, to the Gas Company, Merthyr Tydfil, Glamorganshire.

JOHN L. COCKER, Secretary & Manager.

Sept. 18, 1890.

WANTED, to purchase Gas Carbon, delivered at nearest Station to Gas-Works, in quantities of not less than 4 tons.

Address, stating price per ton and quantity, No. 1766, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.
120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 516.

Inquiries should be addressed to THE AUTOMATIC COAL-GAS COMPANY, LIMITED, 86-88a, LEADENHALL STREET, E.C.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SULPHURIC ACID delivered in Manufacturers' Tanks or Carboys.

Prices on application to HARDMAN and Co., Miles Platting, MANCHESTER.

FOR IMMEDIATE SALE—A small GAS PLANT, for private use. To be seen, fixed complete, in the neighbourhood of Warrington.

Apply, by letter, to No. 1852, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SALE OF £12,500 ORDINARY "D" STOCK IN THE CARDIFF GASLIGHT & COKE COMPANY.

MR. LEWIS GOTTWALTZ (of the Firm of Gottwaltz and Bowring) is favoured with instructions from the Directors of the Cardiff Gaslight and Coke Company, to SELL BY AUCTION, at the ROYAL HOTEL, CARDIFF, on SATURDAY, the 11th of OCTOBER, 1890, at Three o'clock in the Afternoon precisely, subject to Conditions of Sale to be then and there produced.

£12,500 ORDINARY "D" STOCK
IN THE
CARDIFF GASLIGHT & COKE COMPANY,

bearing a Maximum Dividend of 5 per cent. per annum, pursuant to the Cardiff Gas Act, 1887.

The Stock will be offered in Lots of the nominal amount of £100 each, and will, on payment in full of the purchase money, be issued to each purchaser, free of all expense.

Further particulars may be had of Mr. GEORGE CLARRY, Secretary to the Company, at the Gas Company's Offices; of Messrs. SPENCER, CORBETT, AND EVANS, Solicitors; or of the Auctioneer; all of Cardiff.

THE Directors of the Ashford (Kent) Gas and Coke Company, Limited, invite TENDERS for the purchase of the surplus TAR produced on their Works for One year, commencing Nov. 1, 1890.

The Tar will be delivered into Trucks on the Company's Siding, S.E.R.; the Contractor supplying the necessary Barrels or Tanks for it.

The Directors do not bind themselves to accept the highest or any tender.

Tenders must be delivered at my Office not later than Oct. 4.

F. HUGHES-HALLETT, Secretary.

Ashford, Sept. 10, 1890.

EAST LONDON WATER-WORKS COMPANY.

NOTICE is hereby given that the HALF-YEARLY ASSEMBLY OF THE PROPRIETORS will be held at the Company's Office, St Helen's Place, Bishopsgate, E.C., on Tuesday, the 7th day of October, 1890, at Twelve o'clock noon, precisely, pursuant to Act of Parliament.

The Transfer Books in respect of the ordinary Stock will be closed on the 23rd of September inst., and re-opened on the 14th of October, on which day the Dividends on this Stock will be payable.

By order,
I. A. CROOKENDEN,
Secretary.

St. Helen's Place, E.C.,
Sept 15, 1890.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

Price 6s., Cloth Bound, Bevelled Boards,

THE

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CHIEFLY RELATING TO

STRAINS IN STRUCTURES CONNECTED WITH GAS-WORKS.

BY

F. SOUTHWELL CRIPPS, Assoc. M. Inst. C.E.

Reprinted from the JOURNAL OF GAS LIGHTING. *Fully Revised and Corrected by the Author, with many Additions.*

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ESTABLISHED 1872.

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GLASGOW.

PUBLIC ANALYST,
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Price 2s. per dozen, or 10s. 6d. per 100, post free.

CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

NOTE ALTERATION OF ADDRESS.

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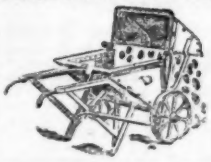

effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 22, Alwyne Road, Canonbury, LONDON, N.

Prices are Reduced.

JAMES NEWTON & SONS,
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FIRE-BRICK AND TILE MERCHANTS,
Wholesale and for Exportation,
FALCON DOCK, 78 AND 79, BANKSIDE,
SOUTHWARK, LONDON, S.E.
DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES and FIRE-CLAY and every Article suitable for
GAS AND WATER WORKS.

SOOTHILL WOOD CANNEL.

Yield of Gas per Ton, over 12,000 Cubic Feet.
Illuminating Power - - - - - 26 Candles.
Coke per Ton, - - - - - - - 57 per cent. of a quality almost equal to that made from the best Coking Coal.

For Analysis and Price, apply to

The Soothill Wood Colliery Co., Ld.,
SOOTHILL WOOD COLLIERY,
BATLEY, YORKSHIRE.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

PATENTS FOR INVENTIONS,

REGISTRATION OF TRADE MARKS and DESIGNS in all Countries.

SEARCHES made *re* novelty, and opinions given on all matters connected with above. *Full particulars on application to*

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Special experience in Gas and Ammonia Plant.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
MIRFIELD, NORMANTON.

NEWBATTLE CANNEL.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

Lanemark Coal Co.,

LIMITED.

LANEMARK CANNEL AND GAS COALS.

Quotations and Analysis on application to

LANEMARK COLLIERY,
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Shipping Ports: All the principal Scotch Ports.

Is now Ready, the Fifth Edition of the

HANDBOOK

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Gas Engineers and Managers.

BY

THOMAS NEWBIGGING,

Member of the Institution of Civil Engineers.

PRICE: MOROCCO, GILT, 18s.; CLOTH, 15s.; DELIVERED FREE.

LONDON:
WALTER KING, "JOURNAL OF GAS LIGHTING," ETC., 11, BOLT COURT, FLEET STREET, E.C.

FOR SALE—Ten £5 paid-up Shares in the Swadlincote Gas Company (near Burton-on-Trent), paying regular and steady dividend of 7½ per cent. Price £9 7s. 6d.; thus paying 4 per cent. on purchase.

Apply to No. 1860, care of Mr. King, 11 Bolt Court, FLEET STREET, E.C.

TO CHEMICAL MANUFACTURERS.

THE Rastrick Gas Company are prepared to receive TENDERS for the Purchase of the GAS TAR and AMMONIACAL LIQUOR made at their Works in Rastrick, for a period of One year, from Oct. 1, 1890.

Tenders, stating the price per ton, to be sent in on or before Saturday, Oct. 4, 1890.

RALPH FEARNLEY,
Secretary.

BRISTOL UNITED GASLIGHT COMPANY.

TENDERS FOR COKE.

THE Directors of the above Company are prepared to receive TENDERS for the purchase of their surplus make of COKE during the twelve months ending the 31st of December, 1891.

Forms of Tender may be obtained on application to the undersigned, to whom also they must be returned not later than Ten a.m. on Monday, the 3rd day of November, 1890, sealed, and endorsed "Tender for Coke."

The Directors do not bind themselves to accept the highest or any Tender.

JAS. V. GREEN,
Secretary.

Chief Offices: Canons' Marsh, Bristol,
Sept. 10, 1890.

BRISTOL UNITED GASLIGHT COMPANY.

TENDERS FOR TAR.

THE Directors of the above Company invite TENDERS for the purchase of the TAR to be produced at all or either of their three Stations during a period of One, Two, or Three years, commencing on the 1st day of January, 1891.

The Annual Quantities of Tar produced at each of the Stations at present are approximately as follows:—

Avon Street	380,000 gallons.
Canons' Marsh	490,000 "
Stapleton	550,000 "

Further particulars, with forms of tender, may be obtained on application to the undersigned, to whom also tenders, sealed, and endorsed "Tender for Tar," must be delivered not later than Ten a.m., on Monday, the 3rd day of November.

JAS. V. GREEN, Secretary.

Gaslight Offices, Canons' Marsh,
Bristol, Sept. 10, 1890.

THE Directors of the Lewes Gas Company invite TENDERS for the purchase of the surplus TAR produced at their Works for one year, commencing Nov. 1, 1890.

The Tar will be delivered into trucks at the Lewes Station of the L. B. & S. C. Railway, the Contractor supplying Barrels.

The Directors do not bind themselves to accept the highest or any tender.

Tenders to be sent to the undersigned, on or before Friday, the 10th of October, 1890.

GEO. WILSON,
Manager.

HARTLEPOOL GAS AND WATER COMPANY.

TO IRONFOUNDERS, ETC.

THE Directors of the above Company are prepared to receive TENDERS for the several Works and Materials required in the construction of a WATER-TANK, 17 ft. 9 in. in height, and 60 feet square, internal measurement, together with built and rolled GIRDERS for supporting the same on Tower of Masonry 82 ft. 8 in. in height; also CAST-IRON COLUMNS, INLET, OUTLET, and OVERFLOW PIPES, STRUTS, STAYS, BOLTS, &c., &c., and a WROUGHT-IRON ROOF, 60 feet span, covered with Corrugated Iron.

Plans and Specification may be seen, or any further information obtained, on application to the Company's Engineer, Mr. Thomas Bower, who, if desired, will supply copies of the plans.

Tenders on form prescribed, and sealed and endorsed "Tender for Water-Tank," to be sent to Mr. Thomas Trewhitt, Secretary, Gas and Water Company, West Hartlepool, not later than Wednesday, the 1st day of October next.

The Directors do not bind themselves to accept the owest or any tender.

By order of the Directors,
THOMAS TREWHITT, Secretary.

Gas and Water Company's Offices,
West Hartlepool, August, 1890.

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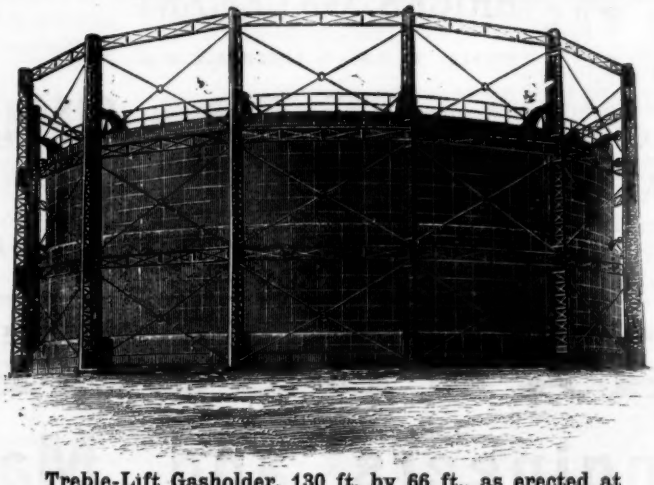

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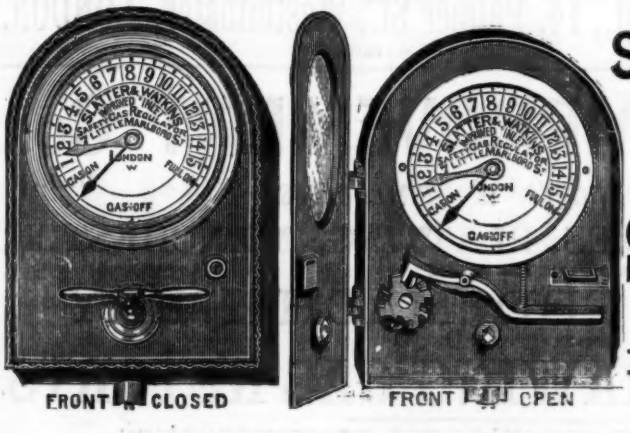

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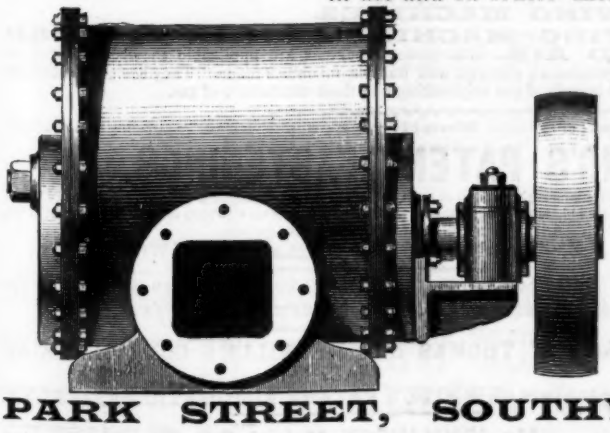

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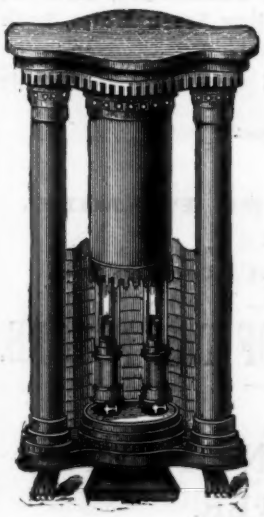

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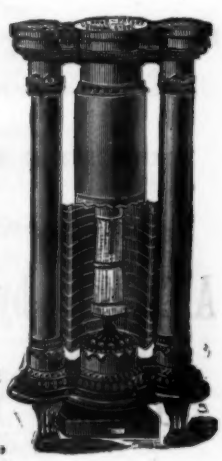

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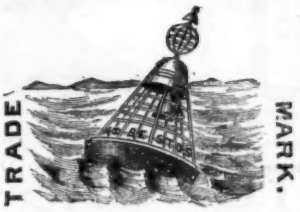
TRADE  MARK.
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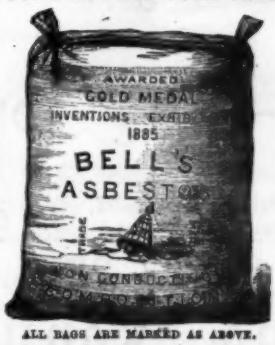
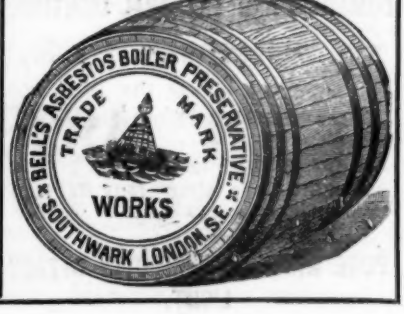


Will reduce loss by radiation and saves 40 per cent. of fuel.
Is superior to any other, and saves its cost in a few months.
Can be applied again after many years' service. Is sent out dry in bags; therefore cheaper than others sent out wet.
ALL BAGS ARE MARKED AS ABOVE.

BELL'S ASBESTOS
BOILER PRESERVATIVE
Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings.



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UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS

AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S 'PATENT' GAS MAIN SYPHONS.

AGENTS FOR

ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

TELEGRAPHIC ADDRESS, "GAS LEEDS."

CLAYTON, SON, & CO.

LIMITED,

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MAKE

RETORT LIDS

OF ALL FORMS AND SHAPES IN IRON OR STEEL

BY SPECIAL HYDRAULIC MACHINERY.

PRICES ON APPLICATION.

WILLIAM INGHAM & SONS,

WORTLEY FIRE-CLAY WORKS,
Near LEEDS

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing Adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

"THE METEOR."

NEW HIGH-POWER GAS-LAMP.

Westphal's Patent.

Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

Particulars and Prices Free.

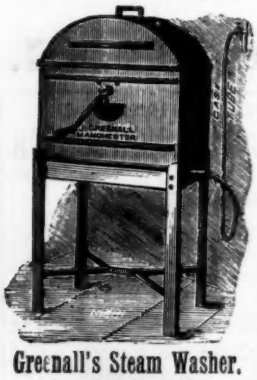
HENRY GREENE & SONS,

SOLE CONSIGNEES FOR GREAT BRITAIN & COLONIES

153 TO 155, CANNON STREET, LONDON BRIDGE, E.C.

IMPORTANT TO GAS COMPANIES.

Hiring out Specialities for Gas Consuming.



Greenall's Steam Washer.
(ORIGINAL PATENT.)

Companies desirous of extending the use of Gas should see the "GREENALL" WASHING MACHINE. The Washer is admirably adapted for domestic purposes, and will execute the work in one-third the time occupied by any other system of washing clothes, while the labour is almost nil. To Laundrymen, the Machine is invaluable.

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The Gas Washing Machine can be seen at the Royal Military Exhibition, Chelsea.

SIXTY PER CENT. ECONOMY IN GAS LIGHTING.

The Schülke Regenerative Lamp

FOR

DOMESTIC AND EXTERNAL LIGHTING.

The only Regenerative Lamp employing the Common Flat-Flame Burners.

Lamps giving 20-Candle power consume less than four feet of Gas per hour.

PURE WHITE & PERFECTLY STEADY LIGHT,

NOT AFFECTED BY DRAUGHTS.

Suitable for any existing fittings (Brackets or Suspending).

Can be fixed in a few minutes.

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WASHER-SCRUBBER and WATER TUBE,

SLOW-SPEED CONDENSER

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These Apparatus are in use at the Gas-Works at Lincoln, Mountain Ash, Neath Ellesmere (Salop), Woodstock (Cape Town); and
Two large CONDENSERS, capable of dealing with **4,000,000** cubic feet of Gas per day have recently been erected at the Gas-Works at Sheffield. A large CONDENSER is also being erected at the Montreal Gas-Works.

PERFECT CONDENSATION. NO POWER REQUIRED.

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GAS and WATER ENGINEERS,

Manufacturers of and Contractors for the Maintenance of

PUBLIC LAMPS & LANTERNS;

GLASS—Flint Opal, and Bent in Stock, and Cut to Sizes.

WELL LAMPS, STREET NAME TABLETS,

LAMP COLUMNS, HEAD IRONS, PUTTYLESS LAMPS,

LANTERN COCKS, REGULATORS.

Improved High-Power Lanterns for Lighting Street Refuges and Open Spaces.

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LAMPLIGHTERS' TORCHES.

PROPRIETORS AND MANUFACTURERS OF

BOX'S PATENT

PUTTYLESS STREET LAMP.

This Lamp may be supplied fitted with clear opal, or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing Lamps to this system can be supplied at moderate prices.

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Manufacturers of

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LAMP METERS.

PRESSURE GAUGES.

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of New Designs.

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GAS, WATER, AND STEAM FITTINGS
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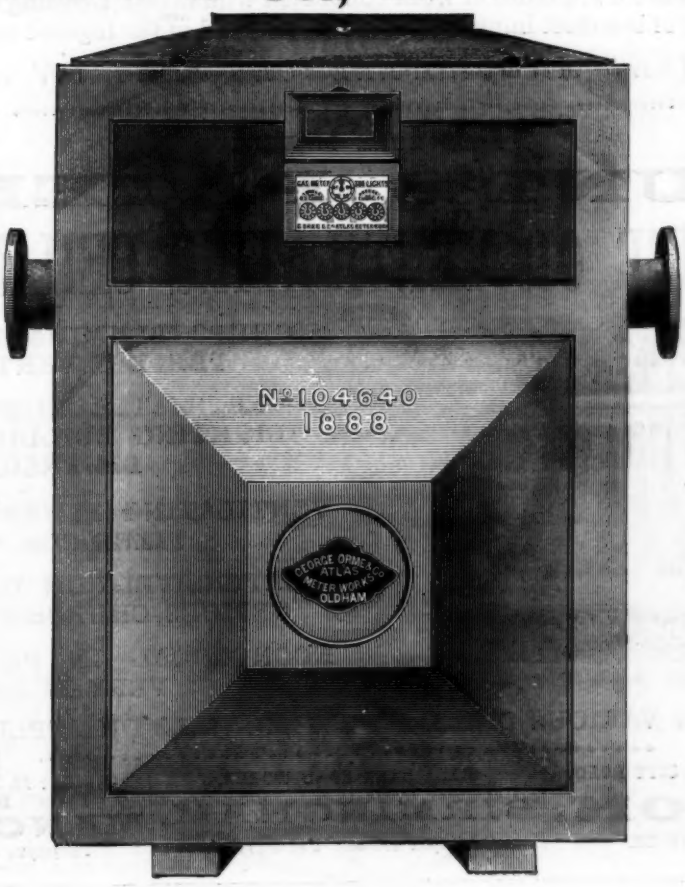

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(BEHL'S PATENT)
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Adopted by the Leading Gas Companies and Corporations.

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IN EVERY SIZE AND STYLE.

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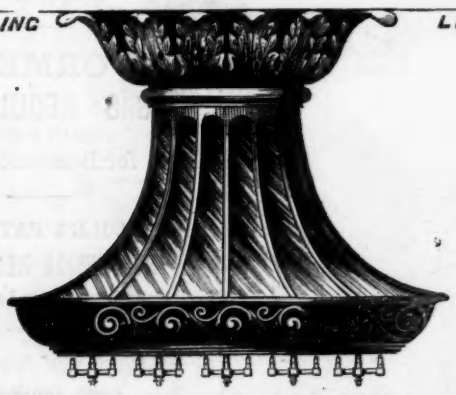

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EXTENSIVELY IN USE IN PUBLIC OFFICES, CHURCHES, HALLS, ETC.

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(See also Advt., p. 638.

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